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An investigation of the shear stress distribution in a simply supported I-beam with a concentrated load acting near one end

Wright, Clarence Chandler

Cambridge, Massachusetts; Massachusetts Institute of Technology

AN INVESTIGATION OF THE SHEAR STRESS DISTRIBUTION IN A SIMPLY SUPPORTED I-BEAM WITH A CONCENTRATED LOAD ACTING NEAR ONE END

CLARENCE CHANDLER WRIGHT
JACK ANTHONY LA SPADA

COPY FOR HEAD OF POSTGRADUATE SCHOOL

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(Inter-Departmental)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Cambridge, Mass.

Office of
W. M. Murray
Room 3-257

September 25, 1946.

Captain W. H. Buracker,
Room 5-233

Thesis Work of LCDR C.C. WRIGHT, USN
LCDR J.A. LaSPADA, USN

Dear Captain Buracker:

In response to your request for information on the thesis work carried out by Lt. Comdr. C. C. Wright and Lt. Comdr. J. A. LaSpada it is a pleasure to tell you that I have been very favorably impressed with the work which they have done and that I am hoping to find someone else to carry on where they left off.

These gentlemen selected an interesting and important problem which they attached in a most thorough and businesslike manner. From the procedure which they adopted I am sure that they have gained valuable experience for themselves and at the same time I feel that they have produced results which will be of considerable value to other people interested in stresses in beams when conditions do not conform to the conditions and limitations of the beam theory.

In my opinion, the work of these two officers was of top notch caliber, and, in addition, it was a great pleasure to be associated with them in the capacity of thesis advisor.

Sincerely yours,

/s/ W. M. Murray

W. M. Murray

Cambridge, Massachusetts
September 16, 1946

Professor J. S. Newell
Secretary of the Faculty
Massachusetts Institute of Technology
Cambridge, Massachusetts

Dear Sir:

In accordance with the requirements for the degree of Master of Science in Naval Construction and Engineering, we submit herewith a thesis entitled "An Investigation of the Shear Stress Distribution in a Simply Supported I-Beam with a Concentrated Load Acting Near One End."

AN INVESTIGATION OF THE SHEAR STRESS DISTRIBUTION IN A SIMPLY SUPPORTED I-BEAM WITH A CONCENTRATED LOAD ACTING NEAR ONE END

By

Clarence C. Wright
Lieutenant Commander, U.S.Navy
B.S., U.S.Naval Academy, 1941

Jack A. LaSpada
Lieutenant Commander, U.S.Navy
B.S., U.S.Naval Academy, 1941

Submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE IN NAVAL CONSTRUCTION AND ENGINEERING

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

1946

ACKNOWLEDGMENT

The authors wish to express their appreciation and indebtedness to the following persons:

To Professor William M. Murray for his assistance and guidance in helping us select the approach to the problem.

To Mr. W. L. Walsh for his instruction in the use of strain gages, and for the use of his personal strain gage indicator.

To Mr. T. A. Hewson for instructing us in the correct procedure for use and application of Stresscoat, for suggesting the use of his strain rosette nomograph, and for other helpful suggestions on the details of this thesis.

To Mr. E. L. Sinclair and Mr. A. F. Lynch of the Materials Section, Boston Naval Shipyard, for their prompt procurement of the necessary materials.

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TABLE OF SYMBOLS

A - Distance from load to near support, feet.

a - Auxiliary gage factor (no units).

B - Distance from load to far support, feet.

b - Thickness of beam at any position, inches.

C - Distance of point from neutral axis, inches.

E - Modulus of Elasticity, pounds per square inch.

I - Moment of inertia of section, (inches)^4.

L - Length of beam span, feet.

M - Bending moment at section, foot-pounds.

Q - First moment of area outside of any line about the neutral axis, (inches)^3.

V - Vertical shear, pounds.

P - Applied Load, pounds.

X - Horizontal distance from left support to any point, feet.

ε_1' - Strain in micro-inches per inch measured by strain rosette in the vertical direction.

ε_2' - Strain in micro-inches per inch measured by strain rosette in a direction equi distant from ε_1' and ε_3'.

ε_3' - Strain in micro-inches per inch measured by strain rosette in the horizontal direction.

ε_1 - Corrected value of strain in micro-inches per inch measured in the vertical direction

ε_2 - Corrected values of strain in micro-inches per inch measured equi distant from ε_1 and ε_3.

ε_3 - Corrected value of strain in micro-inches per inch measured in the horizontal direction.

ϕ - The angle measured counterclockwise from ε_3 to the direction of τ_m degrees.

σ_1 - Vertical Direct stress, pounds per square inch.

σ_3 - Longitudinal direct stress, pounds per square inch.

τ_m - Maximum shear stress, pounds per square inch.

τ_{31} - Shear stress in the 3-1 plane, pounds per square inch.

SUMMARY

I. OBJECT

The object of this thesis investigation was to determine the shear stress distribution in a simply supported I-beam with a concentrated load acting near one end.

II. PROCEDURE

An 8" x 4" x 6.6# aluminum I-beam was tested. This beam was supported [illegible] inches from one end; and by moving the supports, both length of span and position of load from near support were varied. Vertical static loads in increasing increments were applied in each position. (See Figure V for photograph of the laboratory set up.)

One series of test runs was made to obtain data from Stresscoat crack patterns. A second series of runs was made to provide data from SR-4 strain gage measurements.

III. RESULTS

Plots of values of maximum shear stress at various points on the beam for each of four separate test runs are presented.

Strain gage data for the remainder of the strain gage test runs is included in Tables I to XVI.

Data obtained from each of the Stresscoat test runs, giving loading data and crack angles, are found in Tables XVII to XXXI.

SUMMARY

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The object of the thesis was attained in a practicable manner with good engineering accuracy.

The Stresscoat Method of Stress Analysis does not provide sufficient information to obtain quantitative values of shear stress, but does provide a good qualitative tensile strain picture of a loaded specimen.

RECOMMENDATIONS

This investigation should be continued for the entire series of I-beams in general use.

Further investigations should be made in such manner as to provide a maximum of data readings for each pattern of gages, to allow the graphical results expected to be easily faired.

I. INTRODUCTION

A. Concept of the Problem.

During World War II most structural investigations not directly related to winning the war were necessarily deferred. Among the investigations postponed by the Bureau of Ships, U.S. Navy, is the problem presented in this thesis: The Investigation of the Shear Stress Distribution in a simply supported I-Beam with a concentrated load acting near one end.

As stated by the Bureau of Ships in a letter to the authors, "The solution of this problem is of interest in the design of gun girders having a full web plate, in the design of many types of foundations for carrying concentrated loads, of flight deck longitudinals, and, in general, in all problems of transfer of load through shear in a beam. Ultimately, it is desired to make design recommendations in order to achieve greater economies when proportioning beams to resist shear."

Arbitrary limitations on this investigation, which is submitted as the first stages of a work which must certainly be continued to include the entire scope of this problem, were designated by the Bureau of Ships as being

1. The investigation of a flanged section, preferably a built-up or rolled "I" section.

2. The investigation of static conditions, in view of probable limitations imposed by laboratory facilities.

3. The study of the stress field produced under load in a flanged cross-section, rather than an investigation of methods of

reducing stress conditions.

B. Status of the Problem.

Preliminary search for published articles and texts relating to shear stress distribution in I-beam sections has resulted in the opinion by the authors, that no extensive tests to determine shear stress distributions in I-beams loaded other than at the center of the span have been undertaken.

In the preliminary analysis it was decided to limit the loading to values well below the elastic limit of the materials used, both to eliminate permanent deformation of the specimen during each test run and to obtain test conditions which would more nearly realize the loadings normally occurring in service.

The decision of the method of approach followed from examination of laboratory facilities available, which indicated that use of "Stresscoat" (Brittle Lacquer Method for Stress Analysis) would be valuable in searching for the general appearance of the stress field, at least the stress field formed by tensile and compressive stresses due to loading. Further, a transition from these general stress fields to specific quantitative shear stresses could be accomplished by solving for shear stresses from directional strains obtained from SR-4 type electric strain gages. The photo-elastic method of stress analysis was eliminated as an approach to our problem, for the present, on advice from the thesis supervisor, Professor Murray.

One factor which emerged from the preliminary analysis of the problem was the value of selecting a specimen which was a member of

a geometrically similar series; that is, which could be compared to either larger or smaller I-sections by ratios such as the ratio of depth of section to web thickness, or the ratio of depth of section to section modulus, etc. By this selection one of the variables present might be eliminated in the application of results of tests of one particular specimen to general practice. This process of selection was not employed. To reduce the project cost and to utilize surplus material, readily available, a single aluminum section was chosen arbitrarily with the following considerations:

1. The section depth was to be large enough to permit location of more than two rows of strain rosettes.

2. The length of section was to be short enough to provide a span well within the limits of the testing machine, yet great enough to allow the length of span to be introduced as a variable factor in the problem.

Presentation of results by graphical means (see pp 32 to 35) appeared to be of value, in that, since a standard U.S.Navy I-section was tested the results could be directly applied to that section. A mathematical formulation of shear stress distribution in a beam of the type investigated (from test data obtained) was deemed too lengthy a problem for the short period allotted by the curriculum to thesis. However, it is hoped that the data obtained in this investigation are extensive enough to allow future transposition into a mathematical solution of the problem.

A comparison of the observed and theoretical value of shear stresses (obtained from simple beam theory formulas) is made to illustrate the divergence of these values.

II. PROCEDURE

The essential steps followed in this investigation were as follows:

1. Selection of test specimen.

2. Selection of method of testing and means of obtaining data.

3. Determination of stress fields by use of Stresscoat, under varied conditions of span length and position of loading.

4. Determination of strains at specific points by means of strain gages, under varied conditions of span length and position of loading.

5. Calculation of value of maximum shear stress at each gage position from observed strain gage data.

6. Calculation of theoretical maximum shear stress at each strain gage location from simple beam formulas.

7. Comparison of observed and theoretical results.

For detailed discussion of description of equipment and method of testing see Appendix A.

III. RESULTS

1. Plots of values of maximum shear stress obtained from strain rosette data and values of maximum shear stress obtained from simple beam formulas and Mohr's circle vs. distance along the beam are shown on pages 32 to 35

2. Experimental Strain Gage Data are presented on pages 36 to 51

3. Stresscoat Crack Angle Data are summarized on pages 52 to 59

4. In the Stresscoat tests made in this investigation it was noted that the axis of vertical cracks in the lower half of the beam was in all cases displaced approximately one inch from the load position toward the center of the beam, irrespective of the beam span.

5. Superposition of the tension and compression Stresscoat crack contours showed that in most cases the intersections of the cracks obtained from the two different types of loading are perpendicular, as was expected.

6. Within the limits of the loads used, the angle of cracking at a given point in the Stresscoat crack pattern is independent of the load.

IV. DISCUSSION OF RESULTS

The results show that the shear stress distribution in a simply supported I-beam with a concentrated load acting near one end is not exactly that calculated from simple beam formulas and Mohr's Circle.

In general, the shear stress in the upper half of the web is greater than calculated values. In the lower half of the beam web the experimental and calculated shear stresses are in close agreement, except in the vicinity of the support, where an increase in shear stress is observed in all cases. In the upper half of the beam web the maximum value of shear stress does not occur at the position of loading, but the location of this maximum value is displaced towards the center of the span.

Not enough data has been worked up at present to determine accurately the effects of span length and position of load from near support on the ratio of observed maximum shear stress to calculated maximum shear stress.

It is believed that the Stresscoat Crack Angle Data presented above could be combined with calculated values of direct stresses to give a maximum shear stress for comparison with that obtained from strain gage data.

Since for a particular test run the crack contours appeared identical and independent of load, a single loading near, but safely below, the elastic limit, coupled with the increased sensitivity produced by a "cooling" agent, should be sufficient to delineate the direction of principal stresses. In this respect,

too many test runs were made to obtain Stresscoat data before the similarity between crack patterns appeared.

It is believed that the curves of results could have been faired more easily had a greater number of points been obtained by additional strain gage test runs.

The method of obtaining individual strain gage readings, that of using screw type binding posts to connect the test lead to the gage lead, though increasing the time necessary for each run, appears to give more accurate readings and simplifies the procedure of isolating any individual defective gage found.

In order to reduce one of the possible experimental errors, observed strain gage readings were faired to obtain values used in calculations. In some cases a greater number of observations would have permitted more accurate fairing. To allow presentation of similar curves for each test run, faired values corresponding to the same arbitrary loads were used for calculation in all cases.

The effect of reducing strains to even numbers is considered as negligible, since the load scale of the testing machine provided accuracy only to within 5 pounds.

The results are not as extensive as desired by the authors. However, it is believed that the results shown are representative of the shear stress distribution in an I-beam web under the conditions of loading selected for this investigation.

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. The object of the thesis is considered accomplished.

2. The method used to obtain shear stress is practicable, and the nomograph solution provides engineering accuracy with saving of time.

3. Stresscoat runs revealed the following considerations.

a. Use of Stresscoat is advantageous in cases where an overall strain picture is desired. This would be particularly valuable in examinations of a complicated structure which could not be isolated or of which a model could not be built without excessive cost.

b. The use of CO_2 as a "cooling" agent is extremely useful, although matching observed and calibrated strains is not practicable under the cooled conditions.

4. A check on the accuracy of Stresscoat contours can be made by super position of the tensile crack pattern and the compression crack pattern.

RECOMMENDATIONS

The authors recommend the following:

1. That this investigation be continued and enlarged to include tests of I-beams other than the 8" x 4" x 0.8" aluminum I-beam already tested, and that the results be coordinated to determine relations between observed test results on one material and anticipated results in another metal and to determine the influence of varying dimensions on shear stress distribution.

2. That in other investigations of this type, where application of Stresscoat tests is contemplated, the greater proportion of available time be spent in quantitative strain gage tests rather than in qualitative Stresscoat testing.

3. That in any continuance of this investigation the beam be tested in such manner as to provide data at shorter intervals than one reading for each six inches of beam length in each row of gages, and where practicable more rows of gages be introduced.

VI- APPENDIX

APPENDIX A

DETAILS OF PROCEDURE

A. DESCRIPTION OF APPARATUS

1. BEAM

The aluminum I-section tested was an 3" x 4" x 6.6# rolled beam eight feet in length. The properties of this material (as determined from Section 46A13d, Navy Department Specifications, are as follows:

Physical:

Tensile Strength	22,000 lbs/sq in. (maximum)
Elongation	16%

Chemical:

Magnesium	0.8 - 1.2%
Silicon	0.4 - 0.8%
Copper	0.15 - 0.4%
Iron	0.7% (maximum)
Chromium	0.15 - 0.35%
Zinc	0.10% (maximum)
Titanium	0.15 (maximum)
Manganese	0.15% (maximum)
Other elements	0.15% (maximum)
Aluminum	Remainder

The test section was reannealed by the following heat treatment:

1. Heat from room temperature to 850°F at rate of 50° per hour.

2. Bake at 850° for 2 hours.

3. Cool from 850° to room temperature at rate of 25° per hour. This section was selected for the following reasons:

1. It was dimensionally identical with the 8" x 4" x 18.4# steel I-section that is in general use in the U.S. Navy.

2. Its relatively light weight provided for ease in handling.

3. The externally applied loads required to produce reasonable deflections were well within the capacity of any testing apparatus normally used in laboratory examination.

4. The surface scale formation usually present was easily removed to provide the smooth surface prerequisite to even distribution of Stresscoat lacquer and necessary to establish a close bonding between strain gages and the metal.

2. TESTING MACHINE

The testing machine used in all test runs was the Riehle Universal Testing Machine, having a maximum capacity of 100,000 pounds. (See Figures IV and V.)

3. MEASURING DEVICES

2. STRESSCOAT

This material is manufactured by the Stresscoat Division, Magnaflux Corporation. Its application and interpretation followed,

basically, the principles set forth in the Stresscoat "Manual of Operating Instructions".

b. STRAIN GAGES, ETC.

The measuring gages were standard types of SR-4 Bonded Resistance Wire Strain Gages, of types illustrated in Figures I and II, manufactured by Baldwin Southwark Division, Baldwin Locomotive Works. Both single gages of types A-1 and A-5, and rectangular strain rosettes of type AR-1, were used. The single gages were located on the beam flanges where uni-directional stresses were expected. The strain rosettes were bonded to the beam web.

c. NOMOGRAPHS

As a means of reducing time of solution for shear stress from strain rosette data, the nomograph (See Figure III), developed by Mr. T. A. Hewson of the Division of Industrial Cooperation, M.I.T., was a very valuable aid. A comparison of accuracy of nomograph solutions and calculated solutions showed a difference of from 0.4% to 5% in over 100 cases.

B. DESCRIPTION OF TESTS

1. METHOD OF LOADING

The beam was subjected to various static loadings in the testing machine. There were no dynamic load tests due both to preliminary arbitrary limitations placed on the investigation and to lack of available facilities in the Materials Testing Laboratory. The arrangement of movable supports of the testing machine (see Figures IV and V) allowed for variation in length of

beam span and variation in distance between point of application of load and point of support, independent of each other. The supports and loading wedge were faced with one inch diameter half-round, transverse steel bars which provided support and loading, respectively, across the entire width of flange and of a length of not more than ¼ of an inch. (See Figure II). It was considered, therefore, that these members were "knife edges", providing line, rigid support.

2. STRESSCOAT TESTS

Stresscoat tests were made for informative reasons, to determine the appearance of the tensile and compressive strain fields under loading. (A typical Stresscoat pattern for a 3" x 2 5/8" x 2.0# aluminum I-beam is illustrated in Figures VI and VII). The load position and length of span were varied in some of these test runs. Since Stresscoat reacts both to tensile loading, and to compressive loading under certain conditions, some runs were made for each of these two types of loads. The compression load strain patterns were compared with the tensile strain patterns. No effort was made to match observed and calibrated strains. In the cases where strain patterns were matched wide divergence of results was noted. It is not known whether this divergence was due to inability of the authors to correctly match strains or to variation in the sensitivity of the beam patterns and those on the calibration strips. To obtain greatly enlarged areas of strain patterns, the beam surfaces were cooled suddenly

by means of blasts of compressed gaseous carbon dioxide expanding against the metal surfaces. This cooling process has great advantage in a qualitative testing. Greatly increased strain sensitivity of Stresscoat at low temperatures allows a much more complete strain picture, providing the aid of the overall pattern of the entire specimen wherever strains are present. In the test runs of this thesis, for instance, cooling the web surfaces provides strain patterns on the compression side of the neutral axis of the beam. No attempt was made to determine the lacquer sensitivity under the "cooled" conditions.

3. STRAIN GAGE TESTS

The method of loading applied to obtain data for computation of shear stress is described in paragraph B (1), above. Readings of each strain gage's resistance were taken by means of the SR-4 Strain Indicator (See Figure VIII) at each load in each test run. That is, for each run a load was applied and the strain readings were taken; the load was increased and readings were again taken; and so on. The readings taken at approximately 500 pounds load were used as check readings since it was found that readings for zero load could not be compared with any accuracy.

FIGURE I. Location of Strain Gages H-1, H-2, H-3 and H-4 on Bottom of Lower Flange. Note Gages D-1 and D-2 on Under Side of Upper Flange.

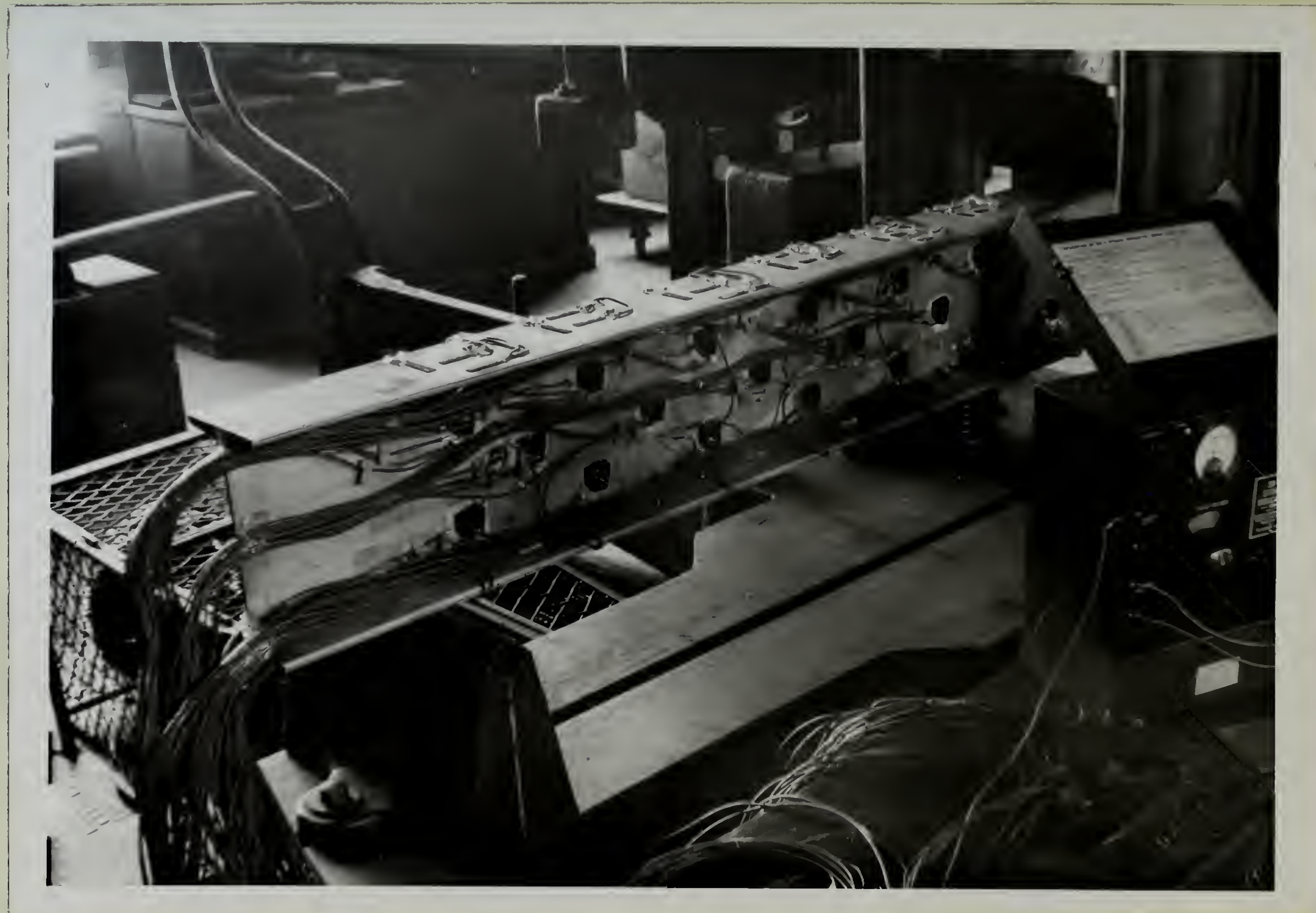


FIGURE II. (a) Location of Strain Rosettes (Rows, E, F, and G) on Flange Web, and Single Strain Gages (Rows A, B, and C) on Top of Upper Flange.

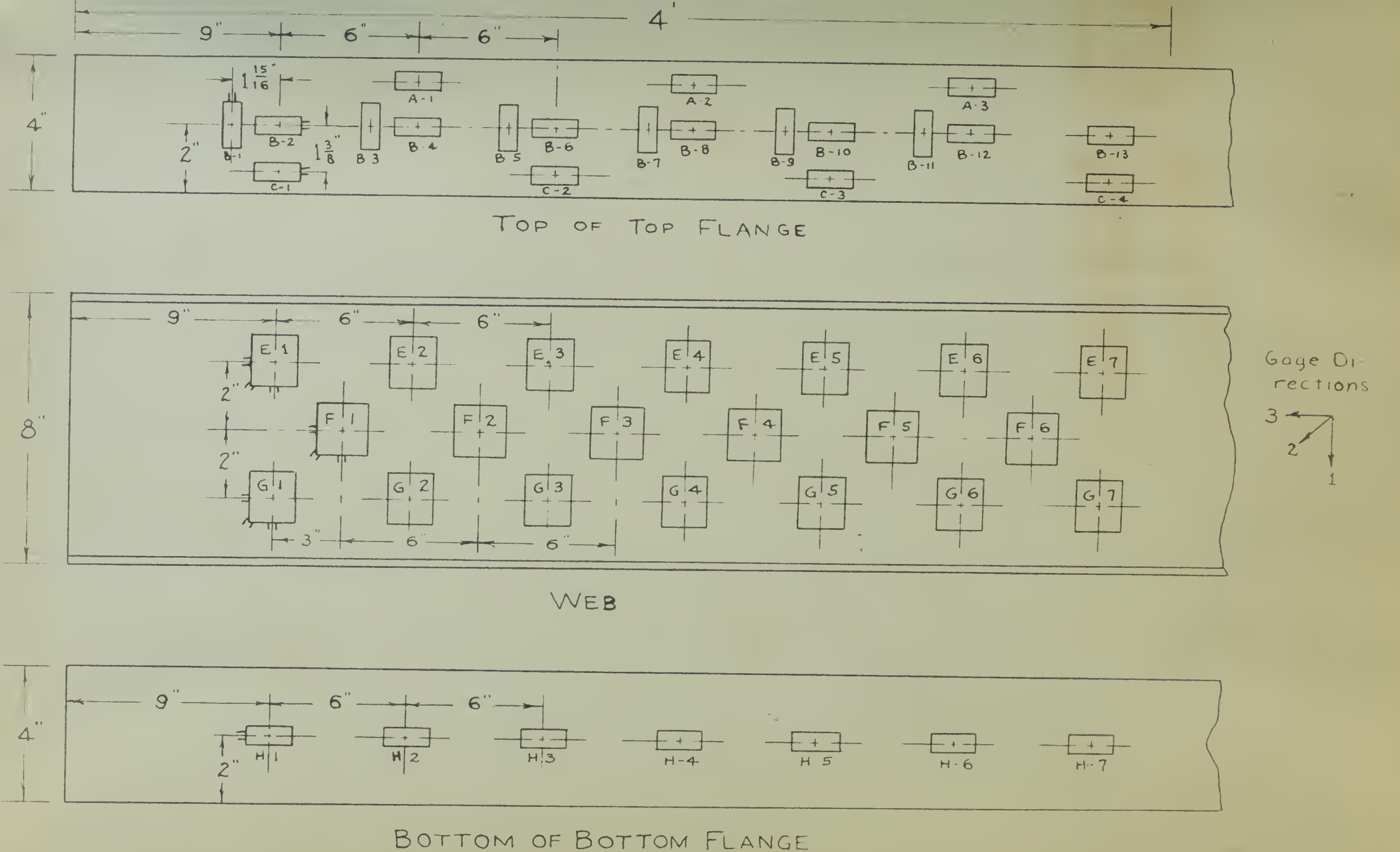


FIGURE II (B). LOCATIONS OF SR-4 STRAIN GAGES.

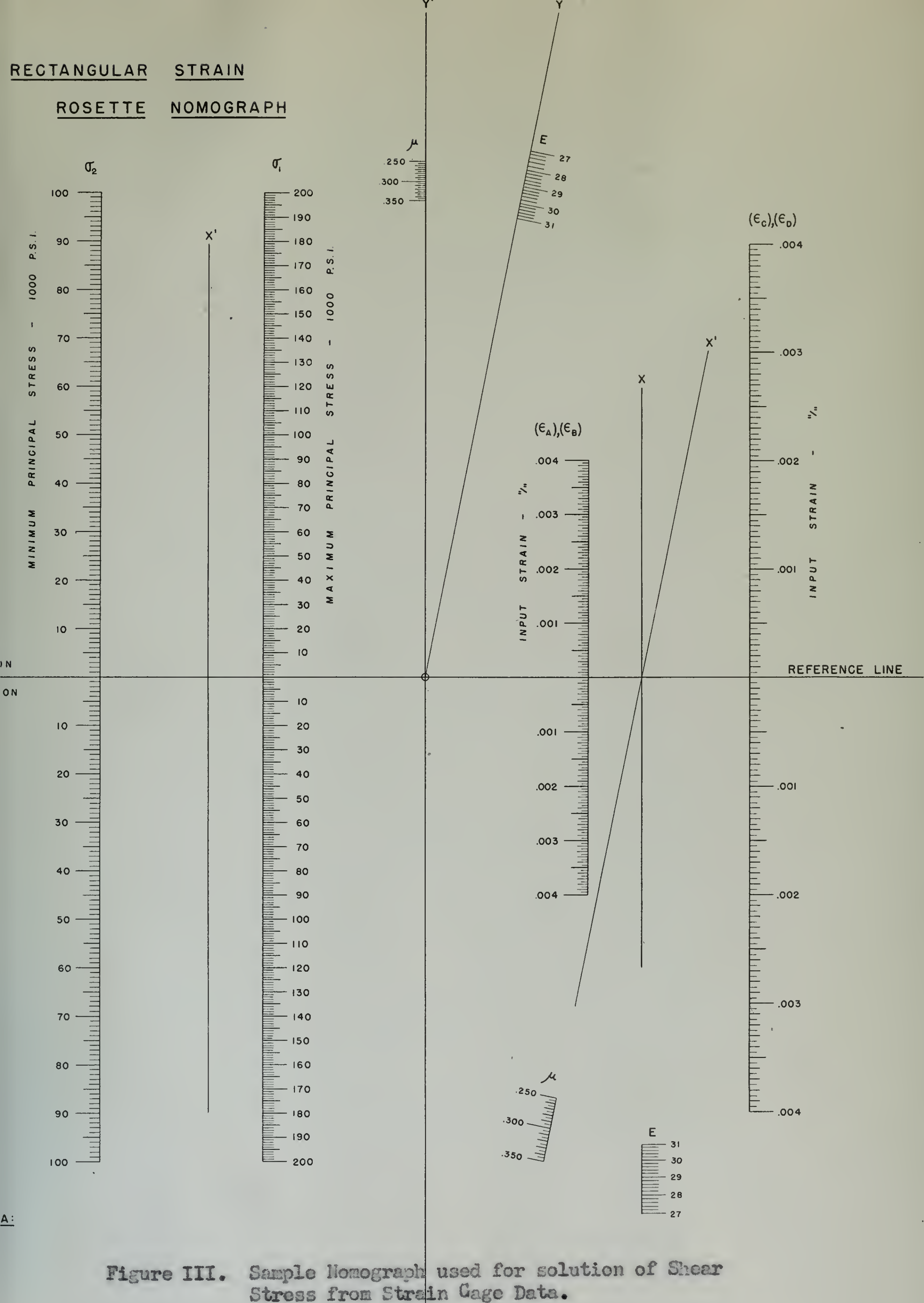


Figure III. Sample Nomograph used for solution of Shear Stress from Strain Gage Data.

FIGURE IV. Riehle Universal Testing Machine with Beam in Position for Loading. Arrows Show Locations of Supports and Loading Wedge.

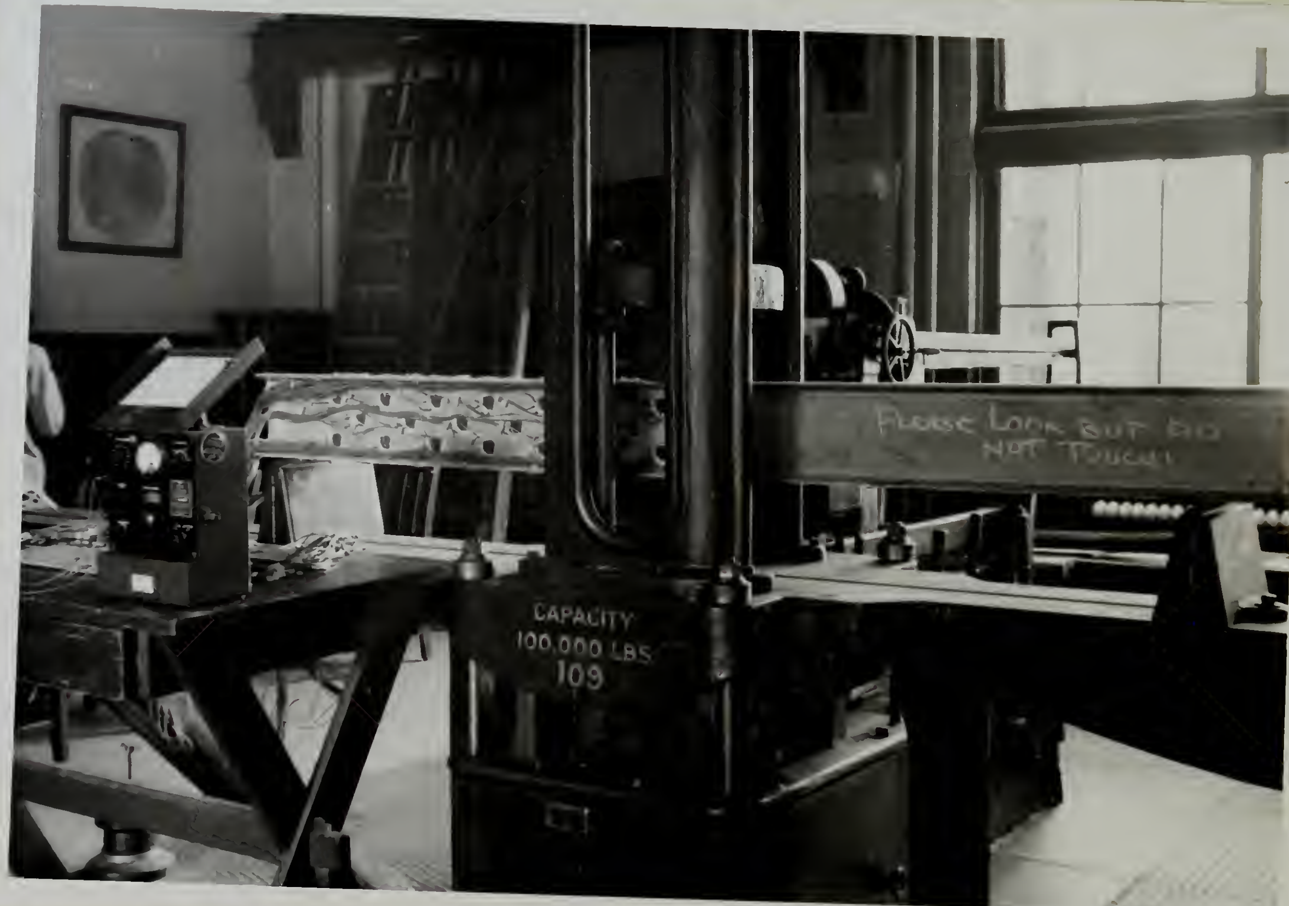


FIGURE V. General View of Test Arrangement.

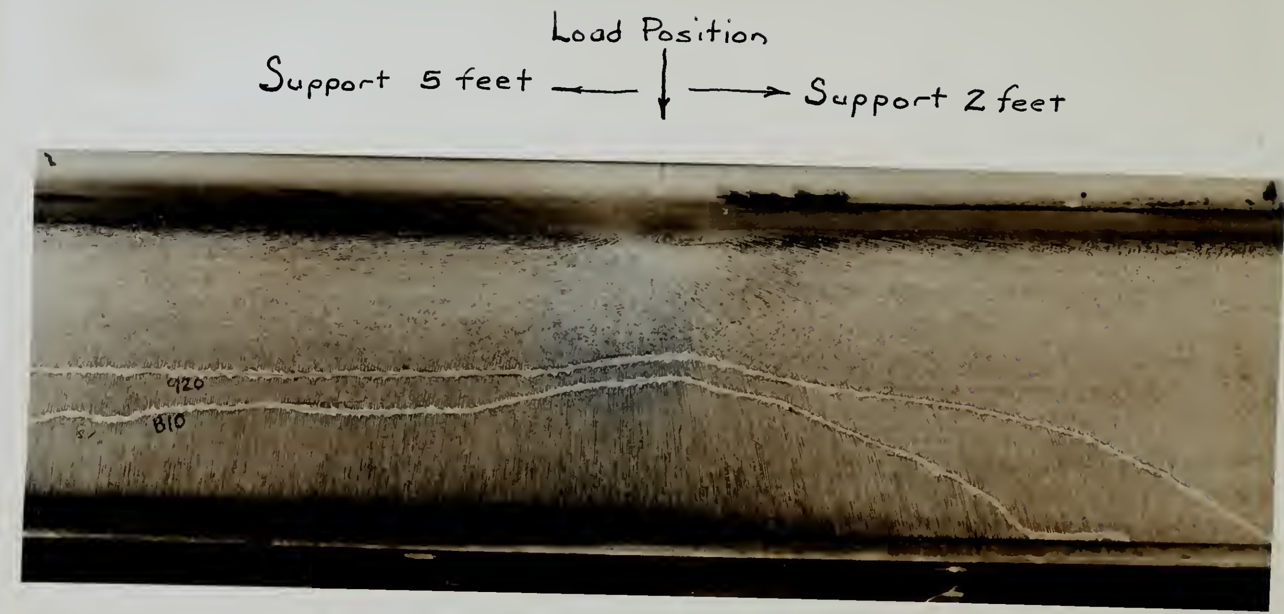


FIGURE VI. Typical Stresscoat Crack Pattern.
Beam shown is 3" x 2 3/8" Aluminum I-Beam.
Heavy scratch lines indicate extent of crack pattern for the load noted. Remainder of crack pattern obtained by use of CO_2 to cool web surface.

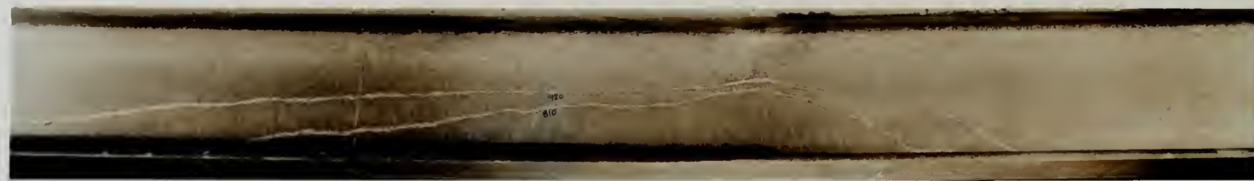
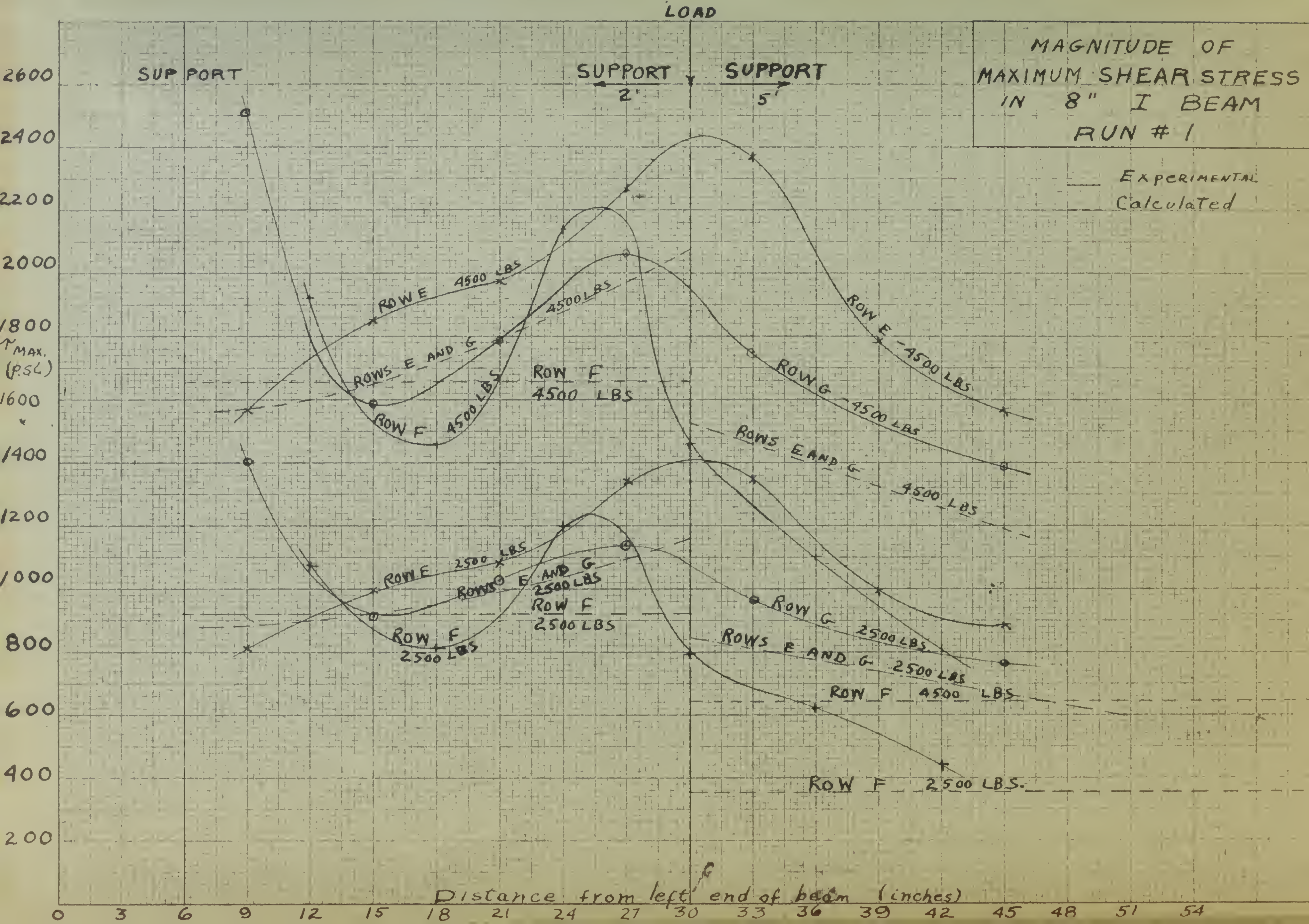


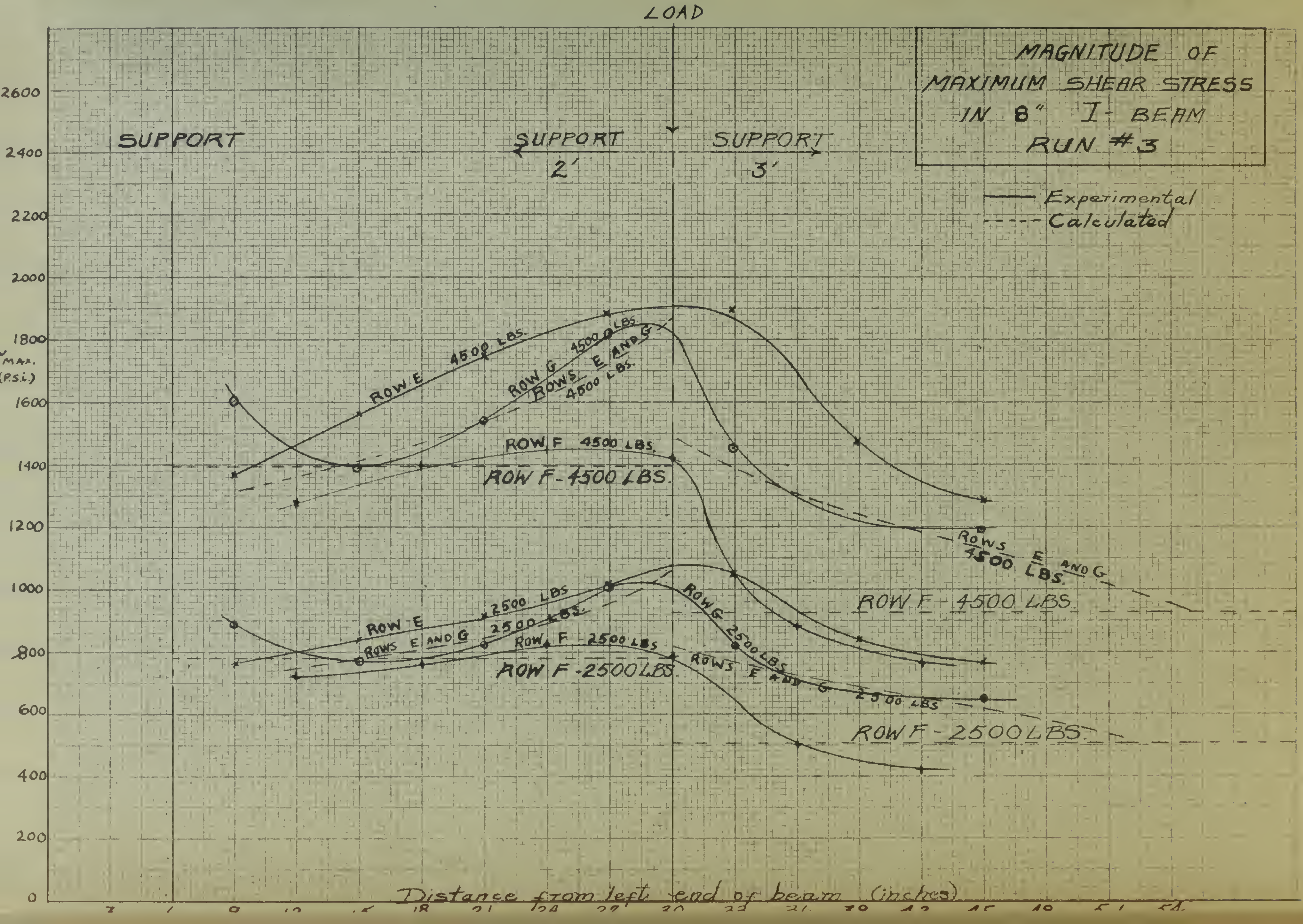
Figure VII. 3" Aluminum Beam with Typical Stresscoat Crack Pattern. This is same beam as in Fig. VI, but a greater length of beam is shown.

FIGURE VIII. Baldwin Southwark SR-4 Strain Indicator used in Beam Tests. Compensating Gage shown in foreground. Note connector strips beside indicator. Binding posts were used to assure positive connection by crushing lead to indicator against lead to individual Gages.

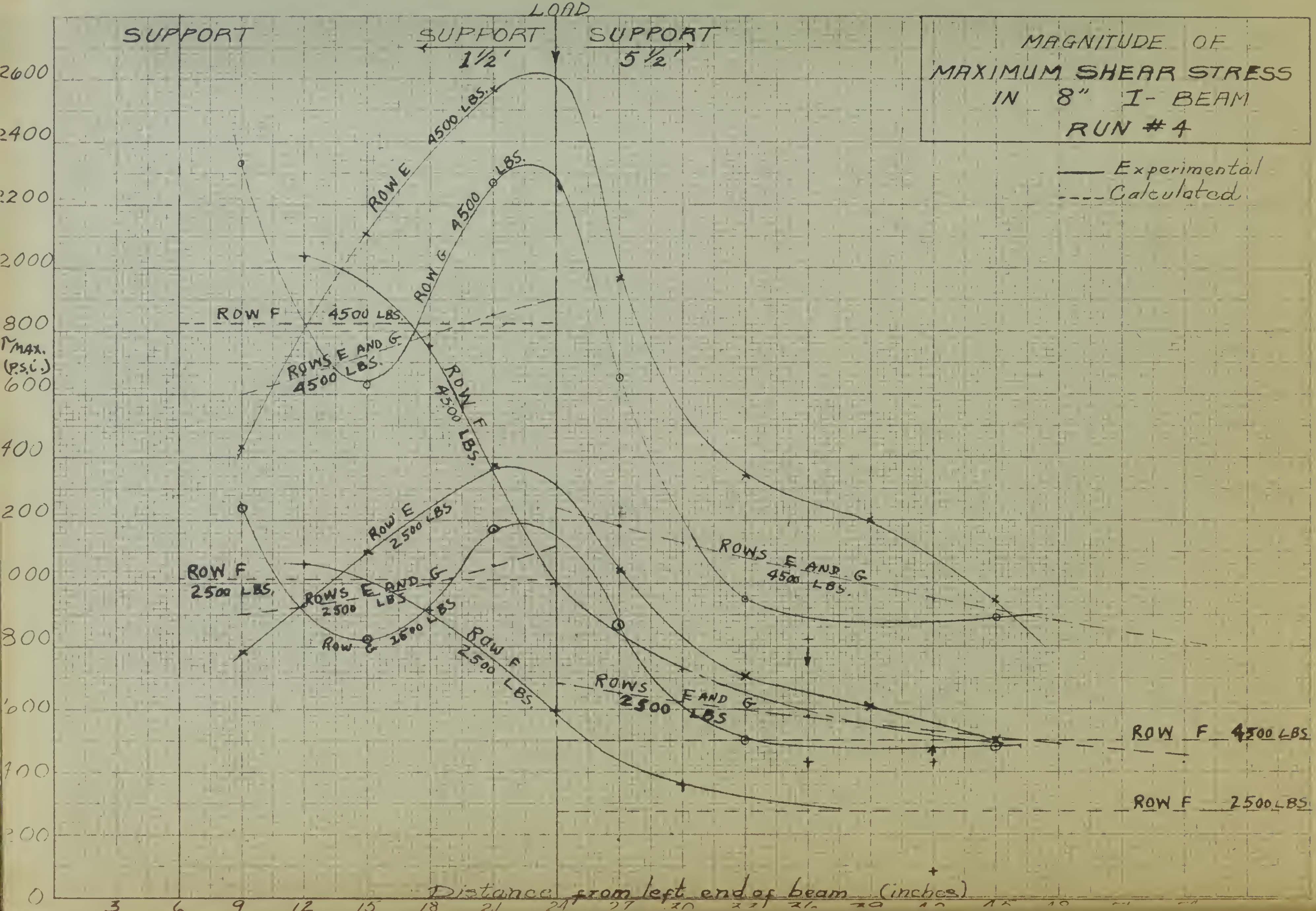
APPENDIX B

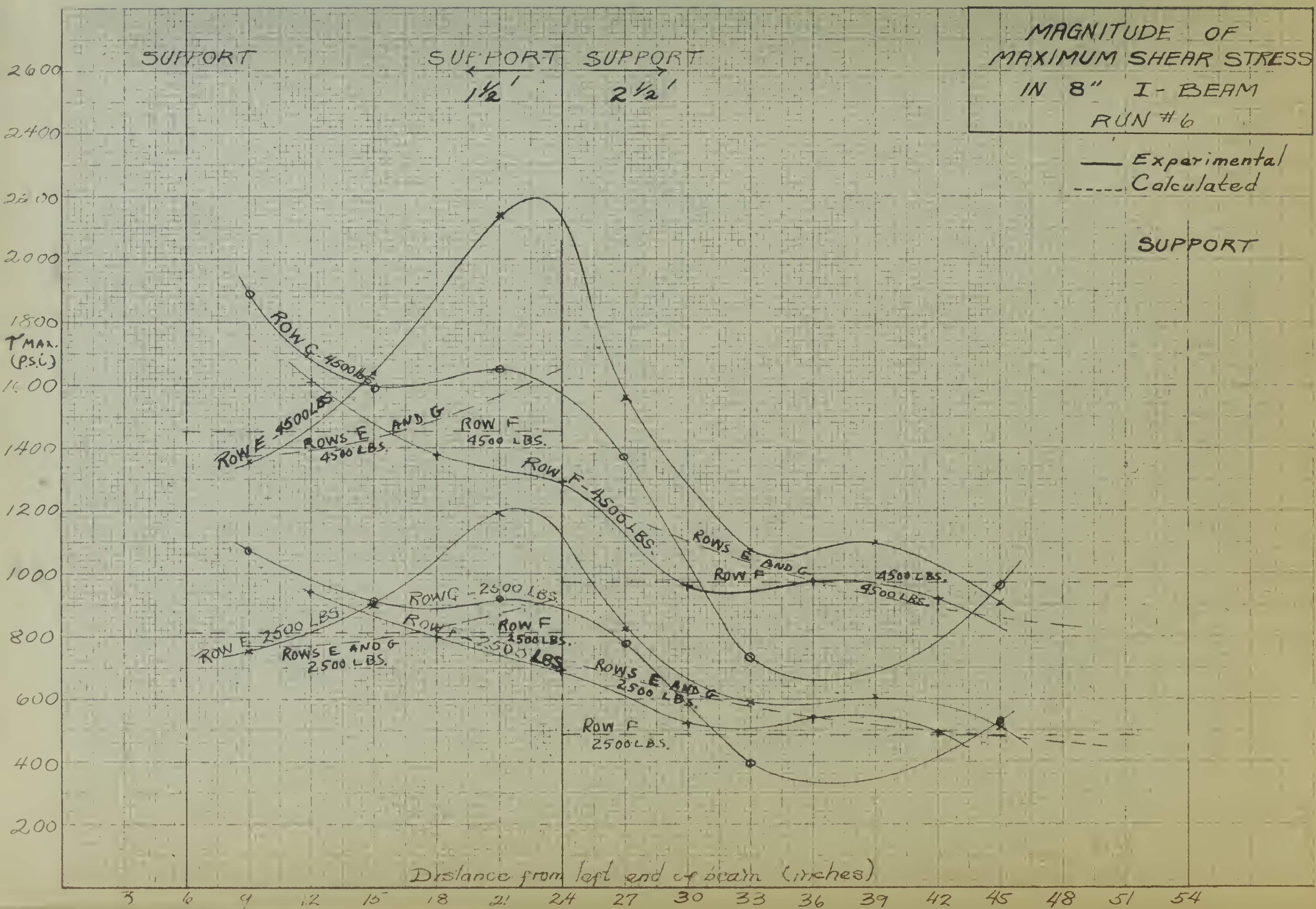
TABLES OF RESULTS


MAGNITUDE OF
MAXIMUM SHEAR STRESS
IN 8" I BEAM
RUN # 1
Experimental
Calculated
LOAD
SUPPORT
SUPPORT
2'
SUPPORT
5'
$\tau_{MAX.}$ (P.S.I.)
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
48
51
54
Distance from left end of beam (inches)
ROW E 4500 LBS
ROWS E AND G 4500 LBS
ROW F 4500 LBS
ROW F 4500 LBS
ROW E - 4500 LBS
ROW G - 4500 LBS
ROWS E AND G - 4500 LBS
ROW E 2500 LBS
ROWS E AND G 2500 LBS
ROW F 2500 LBS
ROW F 2500 LBS
ROW G 2500 LBS
ROWS E AND G 2500 LBS
ROW F 4500 LBS
ROW F 2500 LBS



MAGNITUDE OF MAXIMUM SHEAR STRESS IN 8" I-BEAM RUN #3
Experimental
Calculated
LOAD
SUPPORT
SUPPORT 2'
SUPPORT 3'
ROW E 4500 LBS.
ROW G 4500 LBS.
ROWS E AND G 4500 LBS.
ROW F 4500 LBS.
ROW F - 4500 LBS.
ROWS E AND G 4500 LBS.
ROW E 2500 LBS
ROWS E AND G 2500 LBS.
ROW F 2500 LBS
ROW F - 2500 LBS.
ROW G 2500 LBS
ROWS E AND G 2500 LBS
$v_{max.}$ (P.S.I.)
Distance from left end of beam (inches)


MAGNITUDE OF
MAXIMUM SHEAR STRESS
IN 8" I-BEAM
RUN #4
Experimental
Calculated
SUPPORT
SUPPORT 1½'
LOAD
SUPPORT 5½'
ROW E 4500 LBS.
ROW G 4500 LBS.
ROW F 4500 LBS.
ROW F 4500 LBS.
ROWS E AND G 4500 LBS.
ROWS E AND G 4500 LBS.
ROW E 2500 LBS
ROW F 2500 LBS.
ROWS E AND G 2500 LBS
ROW G 2500 LBS
ROW F 2500 LBS.
ROWS E AND G 2500 LBS
ROW F 4500 LBS
ROW F 2500 LBS
$\tau_{MAX.}$ (P.S.I.)
2600
2400
2200
2000
800
600
400
200
000
800
600
400
200
0
3
6
9
12
15
18
21
24
Distance from left end of beam (inches)



MAGNITUDE OF
MAXIMUM SHEAR STRESS
IN 8" I-BEAM
RUN #6
Experimental
Calculated
SUPPORT
SUPPORT
SUPPORT
SUPPORT
1½'
2½'
ROW G-4500 LBS.
ROW E-4500 LBS.
ROWS E AND G
4500 LBS.
ROW F
4500 LBS.
ROW F-4500 LBS.
ROWS E AND G
ROW F
4500 LBS.
4500 LBS.
ROW G-2500 LBS.
ROW E-2500 LBS.
ROWS E AND G
2500 LBS.
ROW F-2500 LBS.
ROW F
2500 LBS.
ROWS E AND G
2500 LBS.
ROW F
2500 LBS.
$\tau_{MAX.}$ (P.S.I.)
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
Distance from left end of beam (inches)
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
48
51
54

TABLE I.

CALCULATED STRAIN GAGE DATA

Run Number: 1 17 August 1946

Beam Span 7 feet Load Position 2 feet from near support

Load 2500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3	τ_m	ϕ
E-1	-18	-112	-23	-18	-113	-23	-816	44
E-2	3	-135	-67	4	-137	-67	-1000	$35\frac{1}{4}$
E-3	1	-152	-73	2	-154	-73	-1080	$34\frac{3}{4}$
E-4	-17	-212	-187	-13	-212	-187	-1342	$25\frac{3}{4}$
E-5	175	-21	-176	119	-20	-178	-1350	$1\frac{3}{4}$
E-6	34	0	-146	37	+2	-147	988	$-15\frac{3}{4}$
E-7	18	12	-123	21	14	-123	-882	
F-1	-11	-128	-8	-11	-131	-8	1078	45
F-2	-123	1	0	-123	3	-2	810	$24\frac{1}{4}$
F-3	-28	-138	15	-28	-140	16	-1200	$-40\frac{1}{2}$
F-4	-142	-98	+21	-142	-97	24	-794	$-12\frac{1}{2}$
F-5	-29	41	-26	-28	43	-25	620	$45\frac{1}{4}$
F-6	-16	33	-11	-18	35	-11	446	$43\frac{1}{2}$
G-1	-12	-159	0	-12	-162	0	-1400	-44
G-2	-27	-81	45	-28	-83	46	904	$-34\frac{1}{4}$
G-3	-38	-88	65	-30	-91	66	-1034	-32
G-4	-66	-64	115	-68	-66	116	-1136	$-22\frac{1}{2}$
G-5	-62	86	100	-64	87	101	960	20
G-6	115		-42	116		-44		
G-7	-50	66	92	-52	66	95	760	$16\frac{1}{2}$

TABLE II.

CALCULATED STRAIN GAGE DATA

Run Number: 1 17 August, 1946

Beam Span 7 feet Load Position 2 feet from near support

Load 3500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3
E-1	-25	-159	-32	-24	-161	-31
E-2	5	-188	-93	7	-190	-93
E-3	2	-213	-103	4	-215	-103
E-4	-22	-297	-261	-17	-297	-261
E-5	160	-29	-248	165	-28	-251
E-6	51	0	-202	55	3	-203
E-7	25	17	-173	29	20	-174
F-1	-15	-180	-11	-15	-183	-11
F-2	-172	1	0	-172	4	3
F-3	-40	-191	24	-40	-195	25
F-4	-200	-136	+29	-201	-135	53
F-5	-36	59	-56	-37	62	-35
F-6	-25	50	-14	-25	52	-13
G-1	-15	-223	0	-15	-228	0
G-2	-38	-114	63	-39	-117	64
G-3	-56	-121	90	-58	-124	91
G-4	-90	-88	161	-93	-92	163
G-5	-85	120	138	-88	121	140
G-6	160		-60	181		-63
G-7	-69	94	129	-72	95	130

TABLE III.

CALCULATED STRAIN GAGE DATA

Run Number: 1 — 17 August 1946

Beam Span 7 feet — Load Position 2 feet from near support

Load 4500 pounds

	ε'_1	ε'_2	ε'_3	ε_1	ε_2	ε_3	τ_m	ϕ
E-1	-32	-204	-43	-31	-206	-42	1568	-44 1/8
E-2	6	-243	-121	8	-246	-121	1850	-35 1/16
E-3	5	-273	-133	6	-275	-133	1978	35 [illegible]
E-4	-30	-382	-337	-25	-383	-336	2272	26
E-5	207	-37	-314	214	-36	-318	2376	-1 3/4
E-6	64	0	-259	70	4	-260	1786	-15 [illegible]
E-7	31	21	-220	36	25	-221	1504	-11 [illegible]
F-1	-20	-232	-13	-20	-236	-13	1920	-44 [illegible]
F-2	-222	2	0	-222	6	4	1556	23
F-3	-51	-249	29	-52	-254	30	2140	-40 1/4
F-4	-258	-176	37	-259	-175	42	1460	-13 3/8
F-5	-49	74	-46	-48	77	-45	1100	44 3/4
F-6	-32	63	-21	-32	65	-20	814	42 5/8
G-1	-23	-286	0	-23	-292	0	2510	-44
G-2	-49	-145	82	-51	-147	83	1588	-34
G-3	-68	-157	117	-66	-156	118	1784	-51 1/4
G-4	-118	-115	206	-122	-119	211	2062	-21 3/4
G-5	-112	153	179	-116	155	181	1742	19 3/4
G-6	205		-73	207		-83		
G-7	-89	116	166	-93	116	168	1384	16

TABLE IV.
CALCULATED STRAIN GAGE DATA

Run Number: 1 17 August 1946

Beam Span 7 feet Load Position 2 feet from near support

	Load(Pounds)		
	2500	3500	4500
A-1	-115	-163	-207
A-2	-396	-533	-604
A-3	-254	-358	-458
B-1	9	12	15
B-2	-25	-35	-47
B-3	19	26	35
B-4	-113	-159	-203
B-5	45	63	80
B-6	-68	-138	-203
B-7	62	88	111
B-8	-203	-284	-368
B-9	218	305	397
B-10	-249	-343	-442
B-11	73	102	132
B-12	-254	-356	-459
B-13	-168	-255	-345
C-1	-36	-50	-65
C-2	-226	-315	-398
C-3	-404	-554	-724
C-4	-173	-241	-308
D-1	-26	-37	-47
D-2	-135	-190	-245
H-1	54	78	101
H-2	91	128	166
H-3	148	207	266
H-4	372	382	491
H-5	295	391	514
H-6	372	382	491
H-7	214	301	385

TABLE V.

CALCULATED STRAIN GAGE DATA

Run Number: 3 19 August 1948

Beam Span 5 feet Load Position 2 feet near support

Load 2500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3	T_m	ϕ
E-1	-57	-134	-50	-56	-132	-49	-770	-40
E-2	-19	-135	-70	-18	-133	-81	-840	35
E-3	0	-133	-81	0	-136	-81	-940	33 1/4
E-4	-47	-202	-164	-44	-198	-163	-1006	28 3/4
E-5	-7	-7	-169	-3	-3	-169	1060	-25
E-6	0	-13	-139	3	-10	-139	834	-20
E-7	0	0	-108	2	2	-108	694	-22
F-1	-17	-139	-70	-16	-137	-70	-870	36 3/4
F-2	-149	-30	-29	-148	-26	-26	-760	22 1/2
F-3	-29	-136	-60	-28	-134	-59	-858	40 1/4
F-4	-131	-90	25	-132	-88	28	-786	-12
F-5	-20	26	-37	-19	27.5	-37	500	-40
F-6	-26	25	-15	-26	26	-14	420	41 1/2
G-1	-17	-121	-27	-16	-120	-27	-902	45 1/4
G-2	-16	-101	-18	-16	-100	-18	-748	44 1/2
G-3	-55	-101	20	-53	-100	21	-832	-32 3/4
G-4	-84	-96	68	-85	-96	70	-1016	-25
G-5	-74	50	75	-76	50	77	820	16 1/4
G-6	50		-101	52		-102		
G-7	-45	53	20	-45	54	21	654	32

TABLE VI.
CALCULATED STRAIN GAGE DATA

Run Number: 3 — 19 August 1946

Beam Span 5 feet — Load Position 2 feet from near support

Load 3500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3
E-1	-81	-188	-69	-80	-185	-67
E-2	-32	-217	-129	-29	-214	-128
E-3	-0	-168	-115			
E-4	-67	-284	-231	-62	-278	-230
E-5	-0	-9	-238	-4	-4	-238
E-6	0	-18	-194	4	-14	-194
E-7	0	0	-151	3	3	-151
F-1	-24	-194	-99	-22	-192	-99
F-2	-208	-42	-41	-207	-37	-37
F-3	-42	-188	-85	-40	-185	-84
F-4	-185	-126	35	-186	-123	39
F-5	-20	35	-50	-27	154	-49
F-6	-38	35	-20	-38	36	-19
G-1	-23	-169	-38	-22	-168	-38
G-2	-23	-141	-24	-23	-140	-24
G-3	-75	-144	26	-76	-143	28
G-4	-116	-134	95	-118	-134	97
G-5	-104	66	105	-106	66	107
G-6	70		-142	73		-143
G-7	-65	75	30	-66	74	31

TABLE VII.
CALCULATED STRAIN GAGE DATA

Run Number: 3 19 August 1946

Beam Span 5 feet Load Position 2 feet from near support

Load 4500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3	τ_m	ϕ
E-1	-104	-242	-89	-102	-243	-87	-1370	-40
E-2	-38	-279	-130	-36	-281	-129	-1560	35
E-3	0	-240	-148	3	-242	-148	-1640	33¼
E-4	-83	-366	-297	-77	-365	-295	-1876	29¼
E-5	-11	-15	-305	-5	-8	-305	1890	-22
E-6	0	-24	-249	5	-19	-249	1466	-20
E-7	0	0	-193	4	4	-193	1274	-22½
F-1	-32	-251	-127	-29	-253	-126	-1610	-37
F-2	-270	-55	-53	-269	-50	-48	1386	22½
F-3	-55	-239	-110	-53	-241	-109	-1442	40
F-4	-237	-163	43	-238	-162	48	-1420	-12½
F-5	-36	46	-67	-35	49	-66	880	-40½
F-6	-49	45	-27	-48	48	-26	770	41½
G-1	-30	-217	-49	-29	-219	-46	-1600	43½
G-2	-30	-182	-30	-29	-184	-29	-1380	45
G-3	-95	-185	34	-96	-187	36	-1526	-53¾
G-4	-150	-173	122	-153	-175	125	-1816	-25
G-5	-134	86	132	-137	88	135	1454	17
G-6	90		-183	94		-185		
G-7	-80	95	37	-81	98	39	1190	32

TABLE VIII.

CALCULATED STRAIN GAGE DATA

Run Number: 3 19 August 1946

Beam Span 5 feet Load Position 2 feet from near support

	Load (pounds)		
	2500	3500	4500
A-1	-118	-166	-213
A-2	-182	-256	-329
A-3	-230	-322	-414
B-1	-29	-39	-50
B-2	-68	-95	-122
B-3	-25	-35	-45
B-4	-129	-180	-231
B-5	-4	-6	-9
B-6	-168	-235	-304
B-7	11	16	20
B-8	-214	-301	-389
B-9	91	125	164
B-10	-236	-331	-426
B-11	11	16	20
B-12	-227	-319	-410
B-13	-194	-274	-352
C-1	-75	-105	-136
C-2	-213	-299	-384
C-3	-214	-301	-389
C-4	-156	-217	-280
D-1	-72	-102	-131
D-2	-183	-257	-330
H-1	0	0	0
H-2	44	61	79
H-3	82	114	147
H-4	183	257	330
H-5	210	294	380
H-6	144	200	257
H-7	87	121	155

TABLE IX.

CALCULATED STRAIN GAGE DATA

Run Number: 4 23 August 1946

Beam Span 7 feet Load Position $1\frac{1}{2}$ feet from near support

Load 2500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3	τ_m	ϕ
E-1	-35	-117	-27	-34	-116	-26	-780	$-43\frac{1}{2}$
E-2	-5	-153	-55	-4	-152	-55	-1100	39
E-3	0	-217	-176	4	-213	-176	-1380	27
E-4	14	-32	-185	18	-29	-185	1038	$-13\frac{1}{4}$
E-5	23	-9	-113	25	-7	-113	702	$-13\frac{3}{4}$
E-6	22	-2	-94	25	1	-94	612	$-15\frac{3}{4}$
E-7	10	0	-76	12	1	-76	500	$-19\frac{1}{2}$
F-1	-10	-134	-19	-10	-133	-19	-1064	43
F-2	-142	0	-14	-142	3	-11	918	26
F-3	-134	-78	-15	-134	-75	-2	-596	$-2\frac{1}{2}$
F-4	0	20	-32	1	21	-32	360	$-32\frac{1}{2}$
F-5	-29	21	-28	-28	22	-27	432	45
F-6	-4	7	0	-4	7	0	91	$39\frac{5}{8}$
G-1	-25	-147	6	-23	-147	6	-1240	$-41\frac{3}{4}$
G-2	-14	-58	65	-15	-59	63	-822	$-52\frac{1}{2}$
G-3	-51	-114	62	-52	-114	63	-1176	-32
G-4	-80	45	95	-82	45	97	868	11
G-5	-31	43	69	-32	42	70	500	12
G-6	85		-31	86		-33		
G-7	-21	52	70	-22	51	70	482	$15\frac{1}{2}$

TABLE X.
CALCULATED STRAIN GAGE DATA

Run Number: 4 23 August 1946

Beam Span 7 feet Load Position $1\frac{1}{2}$ feet from near support

Load 3500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3
E-1	-52	-169	-40	-51	-167	-39
E-2	-7	-221	-79	-5	-219	-79
E-3	0	-315	-254	5	-310	-254
E-4	20	-47	-269	25	-113	-269
E-5	32	-14	-163	35	-11	-164
E-6	31	-2	-136	34	0	-137
E-7	15	0	-110	17	2	-110
F-1	-16	-193	-27	-15	-195	-27
F-2	-205	0	-18	-205	4	-14
F-3	-194	-114	-22	-194	-110	-18
F-4	0	27	-47	1	28	-47
F-5	-42	30	-40	-41	32	-39
F-6	-5	9	0	-5	9	0
G-1	-33	-214	8	-33	-215	8
G-2	-20	-83	95	-22	-85	95
G-3	-74	-167	89	-76	-167	90
G-4	-115	66	139	-118	66	141
G-5	-44	64	38	-46	62	39
G-6	123		-44	124		-47
G-7	-30	73	100	-32	71	101

TABLE XI.
CALCULATED STRAIN GAGE DATA

Run Number: 4   23 August 1946

Beam Span 7 feet   Load Position $1\frac{1}{2}$ feet from near support

Load 4500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3	τ_m	ϕ
E-1	-68	-223	-52	-67	-221	-51	-1436	$46\frac{1}{4}$
E-2	-8	-289	-105	-6	-287	-103	2114	39
E-3	0	-410	-331	7	-403	-331	2572	$27\frac{1}{4}$
E-4	27	-63	-350	34	-55	-351	-1978	$14\frac{3}{4}$
E-5	40	-18	-214	45	-13	-215	1538	$14\frac{1}{2}$
E-6	41	-3	-179	45	0	-180	1196	$15\frac{3}{4}$
E-7	20	0	-144	23	3	-144	956	$18\frac{3}{4}$
F-1	-19	-252	-36	-18	-251	-36	2040	$43\frac{3}{4}$
F-2	-269	0	-25	-268	6	-20	1766	$25\frac{3}{4}$
F-3	-253	-147	-29	-252	-143	-26	1000	$1\frac{1}{2}$
F-4	0	38	-60	+1	40	-60	664	-33
F-5	-55	40	-52	-54	42	-51	826	$44\frac{1}{2}$
F-6	-6	12	0	-6	12	0	1156	38
G-1	-44	-277	9	-44	-276	10	2338	42
G-2	-27	-110	124	-29	-112	125	1630	$32\frac{1}{4}$
G-3	-95	-216	119	-97	-216	121	2270	$32\frac{3}{4}$
G-4	-150	89	181	-154	88	184	1650	$11\frac{3}{4}$
G-5	-58	82	129	-61	80	130	958	$12\frac{1}{2}$
G-6	162		-55	163		-58		
G-7	-37	98	131	-40	96	132	896	$15\frac{1}{4}$

TABLE XII.

CALCULATED STRAIN GAGE DATA

Run Number: 4 — 23 August 1946

Beam Span 7 feet — Load Position $1\frac{1}{2}$ feet from near support

	Load (pounds)		
	2500	3500	4500
A-1	-123	-176	-229
A-2	-178	-257	-338
A-3	-184	-265	-347
B-1	-25	-37	-49
B-2	-29	-43	-56
B-3	21	29	38
B-4	-124	-179	-234
B-5	38	55	70
B-6	-153	-228	-301
B-7	120	187	247
B-8	-188	-273	-357
B-9	38	59	80
B-10	-181	-262	-345
B-11	47	65	86
B-12	-173	-249	-329
B-13	-162	-233	-304
C-1	-40	-58	-75
C-2	-151	-219	-286
C-3	-188	-273	-355
C-4	-160	-231	-302
D-1	-36	-53	-70
D-2	-165	-239	-314
H-1	49	72	94
H-2	100	145	190
H-3	186	269	352
H-4	208	300	393
H-5	189	274	358
H-6	155	226	298
H-7	146	212	277

TABLE XIII.
CALCULATED STRAIN GAGE DATA

Run Number: 6 26 August 1948

Beam Span 4 feet Load Position $1\frac{1}{2}$ feet from near support

Load 2500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3	τ_m	ϕ
E-1	-18	-97	-11	-18	-98	-11	-750	$45\frac{3}{4}$
E-2	13	-113	-51	14	-114	-51	900	$55\frac{3}{4}$
E-3	7	-135	-100	9	-136	-100	1200	32 7/8
E-4	0	25	-102	2	25	-102	-324	$27\frac{1}{2}$
E-5	18	25	-68	19	27	-68	-592	$24\frac{1}{4}$
E-6	20	39	-54	21	41	-54	-614	28
E-7	8	44	-27	9	45	-27	-512	35 3/8
F-1	-4	-113	-17	-4	-115	-17	944	$42\frac{3}{4}$
F-2	-117	1	-18	-117	4	-16	800	$61\frac{1}{2}$
F-3	-108	-60	39	-100	-60	41	-680	$-8\frac{3}{4}$
F-4	0	49	-14	0	50	-14	-574	$40\frac{3}{4}$
F-5	0	57	-4	0	58	-4	-540	$43\frac{3}{4}$
F-6	0	54	-1	0	55	-1	-498	$44\frac{3}{4}$
G-1	-23	-125	0	-23	-128	0	-1078	$47\frac{3}{4}$
G-2	-11	-85	50	-12	-87	50	-902	$50\frac{3}{4}$
G-3	-42	-70	67	-43	-72	68	-920	$61\frac{1}{4}$
G-4	-55	67	74	-57	68	75	780	$69\frac{1}{2}$
G-5	-16	45	33	-17	46	33	393	$62\frac{1}{2}$
G-6	-12		42	-13		42		
G-7	-16	56	19	-16	57	19	324	$53\frac{3}{4}$

TABLE XIV.

CALCULATED STRAIN GAGE DATA

Run Number: 6 26 August 1948

Beam Span 4 feet Load Postion 1½ feet from near support

Load 3500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3
E-1	-25	135	-17	-25	139	-17
E-2	18	-158	-71	19	-160	-71
E-3	11	-226	-141	14	-228	-141
E-4	0	41	-140	-3	45	-140
E-5	26	35	-93	28	37	-94
E-6	28	55	-75	30	58	-76
E-7	12	61	-38	13	63	-38
F-1	-6	-158	-23	-6	-161	-23
F-2	-151	2	-26	-150	3	-25
F-3	-152	-85	55	-153	-89	54
F-4	0	69	-21	0	70	-21
F-5	0	79	-6	0	81	-6
F-6	0	77	-2	0	79	-2
G-1	-31	-174	0	-31	-177	1
G-2	-15	-118	+42	-16	-121	42
G-3	-57	-97	94	-59	-101	95
G-4	-74	93	104	-76	95	102
G-5	-22	62	45	-23	62	44
G-6	-18		58	-19		57
G-7	-22	78	27	-23	80	27

TABLE XV.

CALCULATED STRAIN GAGE DATA

Run Number: 6   26 August 1946

Beam Span 4 feet   Load Position $1\frac{1}{2}$ feet from near support

Load 4500 pounds

	ε_1'	ε_2'	ε_3'	ε_1	ε_2	ε_3	τ_m	ϕ
E-1	-27	-174	-24	27	-176	-23	-1358	$45\frac{1}{4}$
E-2	23	-203	-92	25	-206	-92	-1636	$55\frac{1}{4}$
E-3	20	-290	-180	24	-293	-180	-2140	$-31\frac{1}{2}$
E-4	0	51	-182	4	56	-182	-1560	$28\frac{1}{2}$
E-5	35	45	-150	35	48	-151	-1076	$23\frac{1}{4}$
E-6	35	70	-97	37	72	-98	-1100	$28\frac{1}{4}$
E-7	15	79	-50	16	82	-50	-902	55
F-1	-7	-198	-29	-6	-201	-31	1610	$43\frac{1}{8}$
F-2	-202	2	-35	-207	7	-29	1370	$62\frac{3}{4}$
F-3	-193	-138	71	-197	-108	75	-1286	$80\frac{1}{2}$
F-4	0	89	-26	1	92	-25	-958	41
F-5	0	101	-9	0	105	-9	-976	$52\frac{3}{4}$
F-6	0	96	-2	0	100	-2	-920	$44\frac{1}{4}$
G-1	-41	-224	1	-41	-227	2	-1890	$47\frac{3}{4}$
G-2	-20	-152	55	-21	-154	55	-1584	51
G-3	-73	-125	122	-75	-129	123	-1649	61
G-4	-93	118	135	-96	119	137	1363	$69\frac{3}{4}$
G-5	-29	81	+59	-28	85	60	728	$61\frac{1}{4}$
G-6	-25		-75	-23		-74		
G-7	-30	101	35	-31	103	34	962	$53\frac{3}{4}$

TABLE XVI.
CALCULATED STRAIN GAGE DATA

Run Number: 6 26 August 1946

Beam Span 4 feet Load Position 1½ feet from near support

	Load (pounds)		
	2500	3500	4500
A-1	-88	-125	-158
A-2	-43	-199	-255
A-3	-98	-138	-178
B-1	0	0	0
B-2	-21	-29	-37
B-3	25	34	43
B-4	-87	-123	-160
B-5	37	52	67
B-6	-118	-165	-213
B-7	107	150	192
B-8	-133	-183	-232
B-9	33	48	61
B-10	-125	-177	-228
B-11	26	37	48
B12	-91	-127	-166
B-13	-57	-79	-101
C-1	-18	-26	[illegible]
C-2	-115	-159	-203
C-3	-130	-180	-231
C-4	-47	-66	-85
D-1	-24	-32	-14
D-2	-154	-216	-277
H-1	53	73	95
H-2	80	114	146
H-3	154	216	279
H-4	168	234	302
H-5	123	172	222
H-6	79	112	145
H-7	44	62	80

TABLE XVII.

STRESSCOAT CRACK ANGLE DATA

Run Number: 1 Load Position at Column 5

Vertical Reference Line Spacing 2 Inches Between Lines.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A						166	157	152	142½	145	146	139	[illegible]		
B															
C		10	8	5		150	150	148	146	137	137	130	[illegible]		
D															
E		16	18			137	140	141	138	136	137	[illegible]	129		
F															
G		35½	46½	70½	116	127	135	135	135	135½	[illegible]	130	126		
H															
I		67½	75	85	105	123	127	131	132	126	134	133	124	110	
J															
K		77½	74½	85½	103½	113	119	119	122½	130	130	[illegible]	118	105	
L															
M	82	80½	81	86	98	108	113	118	120	123	128	132	135	93	90

NOTE: Short End of beam is to right.

TABLE XVIII.

[illegible]

Run Number: 2 — Load Position at Column 9

Vertical Reference Line Spacing, 1 Inch Between Lines.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A																
B																
C																
D																
E		36	37	40												
F																
G	41½	42½	44½	49	52											
H																
I	46	48	52½	56	66½	78	84½	100	112½	117	115					
J																
K	54½	58	61	67	74	82½	85	95½	100	102½	108					
L																
M	61	62½	67	71	75½	[illegible]	89½	90	100	101½	[illegible]	103	102	103	103½	103

TABLE XIX.

STRESSCOAT CRACK ANGLE DATA

Run Number: 3 Load Position at Column 10

Vertical Reference Line Spacing 1 inch Between Lines.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A					15	13	11½	13					175	175			
B																	
C				16	16½	18	19	19					175	176	178		177½
D																	
E				24½	23½	22½	23½	26					172½	174	175½	172	170½
F																	
G				41	39	36	38½	44	51½	59		142½	146	142½	144	143	143
H																	
I			55	54½	54	58½	60½	65½	72½	75	88	95½	98	101	100	99½	99
J																	
K		59½	58½	62	66	72½	76	78½	80	82	91	96½	99	97½	97½	100	101½
L																	
M	66½	70	70	74	78½	80	80	80	81½	88	92	93	94	94	98	95½	95

TABLE XIX. (cont'd.)

STRESSCOAT CRACK ANGLE DATA

Run Number: 3 Load Position at Column 10

Vertical Reference Line Spacing 1 inch Between Lines.

	18	19	20	21	22	23	24
A							
B							
C	176	174	175				
D							
E	174	175	172				
F							
G	142	143	144				
H							
I	98	98	99½	100	101		
J							
K	98½	100	103	96½	100	101	
L							
M	94	95	93½	93½	94	95	98½

TABLE XX.

[illegible] DATA

Run number: 5 [illegible] 23

Vertical Reference Line Spacing 1 inch Between Lines.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A				12	3	6½	3½	10	10½	9	9½	10	10	9½	9	8½	9½
B			17½	11	8	9½	8½	9	9	9	11	10	10½	10	8½	8	8
C		17½	12	11	10	10½	9½	8½	9	11½	13	11½	10	9	8	9	10
D		18½	16	14½	14	12	11½	9½	11	9½	10	12	11	10½	11	10	12
E		30	25	20½	21	20	15½	15	14	14	15	15	13	14	14½	12	11
F		27½	33	28	29	29	32	29	21½	10½	17½	18	16	14	15½	14	12
G	38	35½	33½	37	57½	39	36	34	35	32	32	36	35	32	28	26	22½
H	45	47½	50	52	52	57	55½	62½	66½	65	65	68	68	68	71	69	67
I	54	60	60	61½	60	63	67	69	73	74	75½	78	70	79½	75	72	71½
J	61½	61	65	67	70	71	72	75	75	76	77	76½	75	75½	75½	75	76
K	65	63	74½	76	75½	77½	77½	79	76½	80	77	78	79	78	[illegible]	77	76
L	79	77	77	77	79	79	80½	79	78½	79½	78	78	79	79	78½	79	77
M	76	79	81½	71½	72½	82	83	82	85	85	80	82	85	71	80	80	82

NOTE: Short end of beam is to the right.

TABLE XX. (contd.)

[illegible]

Run Number: 5 Load Position at Column 23

Vertical Reference Line Spacing 1 Inch Between Lines.

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
A	8	6	5½	13½					170	169	133	165	162½	[illegible]	157	154	170½	[illegible]	
B	6	7	13	43		99	138	162	166	170	168	166	163	164	157	159	163	160	
C	9	8	9½	15	30½	100½	148½	160	167	164½	163	160	158	161	158½	170	178	177	[illegible]
D	11	9½	10½	18	30½	117½	146	150½	152	161	159	157	153	157	163	154	152	[illegible]	[illegible]
E	10½	10	13	19	31	128	147	155	157	158	155	152	150	[illegible]	146	147½	143	[illegible]	[illegible]
F	12	15½	21	25	31	131	141	142	141½	151	148	148½	145	[illegible]	141½	143	[illegible]	[illegible]	[illegible]
G	21	21	19	15	48	125½	131	138	139	141	144	140½	133	130	137	139½	154	[illegible]	[illegible]
H	67	67	63½	71	81½	95	108	120½	150	149	134	135	134	132	[illegible]	131	141	[illegible]	[illegible]
I	74	75½	79½	80	87	94	101	112½	116	125	125	127	125½	[illegible]	[illegible]	[illegible]	130	127	[illegible]
J	74½	74½	75½	78	85	91½	105½	105	113	115	118	121	120	123	119	121	121	[illegible]	[illegible]
K	76	77½	78	80	[illegible]	90½	97	102½	105½	102	107	113	[illegible]	109½	108	107	104	105½	
L	77	78	80	63	84	90	97	90	102	102	108	106½	108	108	108	110	110	111	[illegible]
M	79	79	79½	81	82	90	99½	100½	106	101	105½	113	106½	109½	111	113½	114	115½	

TABLE XXI.

[illegible]

Run Number: 8 Load Position at Column 10

Vertical Reference Line Spacing 1 inch Between Lines.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	98	99½	99½	100	97½	97	101	111	144	17	45	63	71	76	75	70	64	71
B	97½	105	104	105	100	99	108	110	141	12	42½	60	67	82	68	67	66	74
C	101	105½	102½	106	103	104	109	114	148	12½	39	56	57½	63	61½	61½	63	65½
D		107	106	104½	107	107	114	117		12	37	53	55	56	61	58	59	61½
E		111	105	107½	105	105½	104	136		12	53	46	50	51½	57½	54	56½	55
F		113	114	116½	122	125½	127	135	0	9	31	45	48½	45½	47	51	53½	54
G		117	120½	125½	124½	132½	136	145	0	13	30	39	43	42½	41	44	50	50
H			135	131½	126	116	132½	163½	0	11	18	30	30	38	45½	45	45	
I			138	136½	140½	121½	168½	169	0	11	16	32	26	32	31	43½	41	
J			137	146	148½	157	162	164½	0	5	14	19½	21	27½	35	35	31½	
K			155½	155½	156½	160	165½	169	0	3	14	19½	21½	27	35	35	32	
L				158	154	160	170	173	0	4	9	16	16½	20½	23½	23½		
M					162	166½	171	172	0	4	12	16	15	16	16			

NOTE: Short end of beam is to right.

TABLE XXII.

STRESSCOAT CRACK ANGLE DATA

Run Number: 9 Load Position at Column 10.2

Vertical Reference Line Spacing 1 inch Between Lines.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A							1	15					165½	164	162	153	
B						0½	0	13	48½				160½	162	158½	155½	
C				10½	5	3	2	14	50	99			151½	158	161	155	154
D			17	13	7	6	6	14	54	107	122	145	154	155	149½		
E			21	19	10	9	10	16½	56	115	128	142	149	146	148		
F		32	27½	27	23	21½	22½	28	75	117½	126	134½	145	141½			
G		41	41½	38½	34	38	52½	53½	90	117	123½	133	158	141½			
H		53½	50½	50½	47½	42½	58	76	40	105	117	127	135	134½			
I		68½	66	58	63	65	70½	79	90	101	113	124	125	132½			
J		68	66½	66	69½	74	77	81	85	101	109	116	118½	123			
K	78	76½	72½	74	74	82	83	83½	85	98½	108	112½	116	115			
L	74½	77	77½	77	80	84	83½	83½	84	93½	106	108	113½	115			
M	80	80	78	77½	82½	85½	86½	85	86	90½	106½	109½	109½	113	112		

APPENDIX C.

SAMPLE CALCULATION

Part I. Computation of Shear Stress from Strain Gage Readings.

Calculation for Run No.[illegible], 1[illegible] August [illegible], Gage [illegible]

Load - 2500 pounds.

From [illegible] readings:

$$\varepsilon_1' = 20$$

$$\varepsilon_2' = [illegible]6$$

$$\varepsilon_3' = -57$$

Then:

$$\varepsilon_1 = \varepsilon_1' - a\,\varepsilon_3'$$

$$\varepsilon_2 = 1.[illegible]\;\; - \;\; a(\varepsilon_1' + \varepsilon_3')$$

$$\varepsilon_3 = \varepsilon_3' - a\,\varepsilon_1'$$

For this gage, a = .0213

Therefore,

$$\varepsilon_1 = -[illegible] - (.0213)(-57)$$

$$\varepsilon_1 = -[illegible] + 0.73$$

$$\varepsilon_1 = -[illegible]$$

$$\varepsilon_2 = (1.[illegible])(26)-(.0213)(-57)$$

$$\varepsilon_2 = [illegible]6.5 + 1.2[illegible]$$

$$\varepsilon_2 = [illegible]8$$

$$\varepsilon_3 = -57 - (.0213)(-20)$$

$$\varepsilon_3 = -57 + .43$$

$$\varepsilon_3 = -57$$

From Nomograph Solution for Shear Stress

$$\tau_m = -500 \text{ lbs/sq.in}$$

$$\phi = -40^{\circ}$$

Part II. Computation of Shear Stress from Simple Beam Formulas:

For Run No. 3, 12 August 1946, Position F-5

$W = 2500$ lbs.

$A = 2$ ft.

$B = 3$ ft.

$L = 5$ ft

$$V = -\frac{WA}{L}$$

$V = -1000$ lbs.

$Q = 8.04$ in.^{3} (obtained by integrating tracing of beam cross-section)

$I = 55.6$ in.^{4} (obtained as above)

$b = .28$ in. (from direct meas.)

$$\tau_{31} = \frac{VQ}{Ib}$$

$$= \frac{(-1000)(8.04)}{(55.6)(.28)}$$

$\tau_{31} = -516$ lbs/sq.in

$$M = \frac{WA}{L}\ (L-X)$$

$$= \frac{(2500)(2)}{5}\ (5-2.25)$$

$$= (2500)(2)(2.75)$$

$M = 2750$ ft. lbs.

$C = 0$

$\sigma_3 = 0$

$\sigma_1 = 0$ (assumed)

$$\tau_m = \pm\sqrt{\frac{(\sigma_3-\sigma_1)^2}{2} + \tau_{31}^2}$$

$$= \pm\sqrt{0 + (516)^2}$$

$\tau_m = \pm\ 516$ lbs./sq.in

b. For Run No. 1, 17 August 1946, Gage Position E-2

$W = 4500$ lbs.

$A = 2$ ft

$B = 5$ ft

$L = 7$ ft

$C = 2$ in.

$b = .28$ in.

By integration of section

$Q = 7.54 \text{ in.}^3$

$$V = \frac{WB}{L}$$

$$= \frac{(4500)(5)}{7}$$

$V = 3210$ lbs/sq.in

$$\tau_{s_1} = \frac{VQ}{Ib}$$

$$= \frac{(3210)(7.54)}{(55.6)(.28)}$$

$= 1557$ lbs/sq.in

$$M = \frac{WBX}{L}$$

$$= \frac{(4500)(5)(.75)}{7}$$

$M = 2410$ ft. lbs.

$$\sigma_3 = \frac{Mc}{I}$$

$$= \frac{(2410)(2)(12)}{55.6}$$

$\sigma_3 = 1040$ lbs/sq.in

$\sigma_1 = 0$ (assumed)

$$\tau_m = \pm\sqrt{\left(\frac{1040}{2}\right)^2 + (1557)^2}$$

$\tau_m = \pm\ 1643$ lbs/sq.in.

APPENDIX D

OBSERVED DATA

DESCRIPTION OF DATA:

STRESSCOAT DATA

This data is presented as loading data and crack angle data. The loading data provides information on type of load, position of load, etc., for each test run. The crack angle data summarizes the angles of the individual Stresscoat cracks. These angles were measured from the horizontal in a counter clockwise direction from the right. These data provide information which would enable any person to reconstruct the tensile strain pattern for each load listed. The method of obtaining this crack angle data was as follows:

1. After completion of the test run and application of CO_2, the beam was removed from the testing machine and a rectangular reference grid system marked off covering the area of the crack pattern. The reference lines were run parallel to the assumed neutral axis and at right angles to the assumed neutral axis. The columns (numbered 1, 2, 3, etc.) represent lines drawn perpendicular to the neutral axis, and lines (lettered A, B, C, etc.) represent lines parallel to the neutral axis.

2. The angle of cracking was then measured at each intersection of the grid reference lines.

3. Explanation of labelling of reference lines.

a. Low numbers are to the left, looking towards the beam, in all cases.

b. Unless otherwise stated, the short span is to the left.

c. Longitudinal reference lines are spaced ½ inch between lines; vertical reference lines are spaced as noted on each data sheet.

4. The position of the beam neutral axis is on reference line G.

STRAIN GAGE DATA

Data is presented for each test load of each run made, in the sequence of loading. From this observed data the observed values were faired, and the faired data used to obtain values of strain for calculation of results. The strain indicator reference position value was omitted from these tables of observed data, since all data under each reading are based on the same reference position. The values given in the columns under each load are expressed in micro-inches per inch.

[illegible] DATA

[illegible] Number 1 | Date: 1 July [illegible]

Beam Span 7 feet

Strain Gage Data:
Number [illegible]
Sensitivity .0006 in/in

Load Data:
Compression (or Tension)
Load Position 1½ feet from near support

Loading time (sec.)	Scale Load (lbs.)	Effective Load (lbs.)	Time Unloaded (sec.)	Cycle Time (sec.)	Remarks (Crack Locations)
40	3500	3500	175	245	None
76	3960	3960	200	320	None
176	4550	4550	140	320	None
170	5820	5820	190	420	Top of Bottom Flange and Bottom of Web Beneath Load
207	6910	6910	376	590	Increased "Crack" Area

TABLE XXIV

[illegible]

Run Number [illegible] | Date: [illegible] July 1945

Beam Span 7 feet

Load Data:
(Compression (or Tension)
Load Position [illegible] feet from near support

Brush[illegible] Data:
Number 1200
Sensitivity:

Loading Time (sec.)	Scale Load (lbs.)	Effective Load (lbs.)	Time Underload (sec.)	Cycle Time (sec.)	Remarks (Crack Locations)
[illegible]	3000	3000	61	173	None
10	4060	4050	58	75	Top of Bottom Flange Above near Support
61	5000	5000	65	132	No Increase
152	6010	6010	101	253	Bottom of Bottom Flange Beneath Load
195	6970	6970	115	320	Increased Crack Areas

STRESSCOAT LOADING DATA

Run Number 3

Beam Span 7 feet

Load Data:
Compression (or Tension)
Load Position 2 feet from near support

Date: [illegible]

Stresscoat Data:
Number [illegible]
Sensitivity .000[illegible]4 in/in

Loading Time (Sec.)	Scale Load (Lbs.)	Effective Load (Lbs.)	Time Underload (Sec.)	Cycle Time (Sec.)	Remarks (Crack Locations)
[illegible]	[illegible]	[illegible]	125	[illegible]	Top of top flange and bottom of bottom flange when load was released, showing load off center
132	[illegible]	[illegible]550	160	[illegible]	Increased area on top of top flange. New crack area on top of bottom flange.
160	4040	4040	147	[illegible]	New area at bottom of web beneath load.
210	5570	5570	312	[illegible]	Increased crack areas

TABLE XXVI

[illegible]

Run Number 4

Date: 1[illegible] July 1[illegible]

Beam Span 7 feet

Structural Data:
Number [illegible]08

Load Data:
Compression (or Tension)
Load Position 1[illegible] feet from near support

Loading Time (Sec.)	Scale Load (lbs.)	Effective Load (lbs.)	Time Under Load (Sec.)	Cycle Time (Sec.)	Remarks (Cause of Loadings)
		(Initial Load [illegible] pounds)			
35	3040	1000	95	130	None
22	2030	3490	125	157	None
75	1810	3710	140	220	None
65	940	4580	130	195	None
70	50	5400	75	145	None

TABLE XXVII

STRESSCOAT LOADING DATA

Run Number 5 — Date: 22 July 1[illegible]

Beam Span 7 feet — Stresscoat Data:

Load Data: — Number 1[illegible]

Tension Load — Sensitivity .00083 in/in

Load Position 2½ feet from near support

Loading Time (Sec.)	Scale Load (lbs.)	Effective Load (lbs.)	Time Underload (Sec.)	Cycle Time (Sec.)	Remarks (Crack Locations)
77	2970	2970	91	187	None
66	3080	3080	98	171	Top of bottom flange beneath load. Bottom of bottom flange beneath load.
60	4450	4450	150	217	Increased areas as above
108	5030	5030	214	322	Increased areas as above. Bottom of web beneath load.
107	5440	5440	113	230	Increased areas as above
168	5320	5320	314	463	Increased areas as above

TABLE XXVIII

STRESSCOAT LOADING DATA

Run Number 6

Beam Span 7 Feet

Load Data:
Compression (or Tension)
Load Position 3 feet from rear support

Date: 12 July 19[illegible]

Structural Data:
Number 1708
Sensitivity .0010 in/in

Loading Time (Sec.)	Scale Load (lbs.)	Effective Load (lbs.)	Time Underload (Sec.)	Cycle Time (Sec.)	Remarks Crack Location
75	2960	2960	61	164	None
78	3470	3470	38	131	None
83	3970	3970	155	228	Top and bottom of bottom flange near the load
90	4345	4345	170	270	Increased areas as above. Areas on bottom of web beneath load.
125	4830	4830	173	308	Increased areas as above
160	5410	5410	248	438	Increased areas as above

TABLE XXIX

STRESSCOAT LOADING DATA

Run Number 7 — Date: 2[illegible] July 1949

Beam [illegible] 7 feet — Stresscoat [illegible]: Number [illegible]

Load Data:
Compression (or Tension)
Load position 7 feet from [illegible] support

Loading Time (Sec.)	Scale Load (Lbs.)	Effective Load (Lbs.)	Time Underload (Sec.)	Cycle Time (Sec.)	Remarks (Crack Locations)
	[illegible]	[illegible]		270	None
	660	660		480	Top and bottom of [illegible] beneath load
	810	810		710	Increase [illegible] as above. Bottom of web beneath load
	920	920		600	Increased crack [illegible]

Note: This beam was 3" x 2 3/8" I section.

TABLE XXX

[illegible]

Run Number [illegible] — Date: 27 July [illegible]

[illegible] — Strain Gage Data: [illegible]

Load Data: [illegible] — Sensitivity .00071 [illegible]

[illegible]

Loading Time (sec.)	Scale Load (lbs.)	Effective Load (lbs.)	Time Unloaded (sec.)	Cycle Time (sec.)	Remarks (Crack Locations)
	4700	0			
60	[illegible]	[illegible]	75	175	None
	4670	0			
55	25[illegible]	2260	108	245	None
	4770	0			
60	2000	2770	82	207	None
	4670	0			
65	1480	3190	185	285	None
	4760	0			
48	1130	3550	281	417	Upper [illegible] filler under load. Top [illegible]
	4710	0			
172	570	4140	95	406	Increased areas as above

TABLE XXXI

STRESSCOAT LOADING DATA

Run Number 9 — Date: 2[illegible] July 1948

Beam Span 6 feet — Stresscoat Data:

Load Data: — Number

Tension Load — Sensitivity in/in

Load Position 2 feet from near support

Loading Time (Sec.)	Scale Load (lbs.)	Effective Load (lbs.)	Time Underload (Sec.)	Cycle Time (Sec.)	Remarks (Crack Locations)
32	3270	3270	105	202	None
35	3870	3870	129	168	None
15	4560	4560	55	75	Top of bottom flange at near support
100	5260	5260	45	155	Increased areas as above
65	5950	5950	55	125	Increased areas as above
90	6410	6410	1[illegible]0	240	Increased areas as above. Bottom of web beneath load.

TABLE XXXII

STRAIN GAGE READING NUMBERS vs. STRAIN GAGE NUMBERS

Reading Number	Gage Number	Reading Number	Gage Number	Reading Number	Gage Number
1	B-5	31	E-6-3	66	G-5-3
2	B-6	32	E-6-2	67	G-5-2
3	C-2	33	E-6-1	68	G-5-1
4	B-7	34	E-5-3	69	H-5
5	A-2	35	E-5-2	70	G-4-3
6	B-8	36	E-5-1	73	G-4-2
7	B-9	37	E-4-3	74	G-4-1
8	B-10	38	E-4-2	75	H-4
9	C-3	39	E-4-1	76	G-3-3
10	B-11	40	E-3-3	77	G-3-2
11	A-3	41	E-3-2	78	G-3-1
12	B-12	42	E-3-1	79	H-3
13	B-13	43	F-5-1	80	G-2-3
14	C-4	44	F-5-3	81	G-2-2
15	E-2-3	45	F-4-3	82	G-2-1
16	E-2-2	46	F-4-2	83	H-2
17	E-2-1	47	F-4-1	84	G-1-3
18	E-1-3	48	F-3-3	87	G-1-1
19	E-1-2	49	F-3-2	88	G-1-2
20	E-1-1	50	F-3-1	89	H-1
21	D-1	51	F-2-3	90	F-6-1
22	D-2	52	F-2-2	91	F-6-2
23	B-1	53	F-2-1	92	F-6-3
24	B-2	54	F-1-1	93	G-7-1
25	C-1	55	F-5-2	94	G-7-2
26	B-3	61	H-7	95	G-7-3
27	A-1	63	G-6-3	96	E-7-1
28	B-4	64	G-6-1	97	E-7-2
29	F-1-3	65	H-6	98	E-7-3
30	F-1-2				

TABLE XXXIII

STRAIN GAGE CONSTANTS

Gage Number	Gage Factor	Auxiliary Factor	Calibrated Res. (ohms)
A-1	2.04		119.6
A-2	2.09		120.0
A-3	2.09		120.0
B-1	2.04		119.6
B-2	2.04		119.6
B-3	2.04		119.6
B-4	2.04		119.6
B-5	2.04		119.6
B-6	2.04		119.6
B-7	2.04		119.6
B-8	2.09		120.0
B-9	2.09		120.0
B-10	2.09		120.0
B-11	2.09		120.0
B-12	2.09		120.0
B-13	2.09		120.0
C-1	2.04		119.6
C-2	2.04		119.6
C-3	2.09		120.0
D-1	2.09		120.0
D-2	2.09		120.0
E-1	2.07	.0200	120.1
E-2	2.07	.0200	120.1
E-3	2.07	.0200	119.9
E-4	2.07	.0200	119.9
E-5	2.07	.0213	120.3
E-6	2.07	.0213	120.1
E-7	2.07	.0213	120.1
F-1	2.07	.0200	120.1
F-2	2.07	.0200	119.9
F-3	2.07	.0200	119.9
F-4	2.07	.0213	120.3
F-5	2.07	.0213	120.3
F-6	2.07	.0213	120.1
G-1	2.07	.0200	120.1
G-2	2.07	.0200	120.1
G-3	2.07	.0200	119.9
G-4	2.07	.0213	120.3
G-5	2.07	.0213	120.3
G-6	2.07	.0213	120.1
G-7	2.07	.0213	120.1
H-1	2.09		120.0
H-2	2.09		120.0
H-3	2.09		120.0
H-4	2.09		120.0
H-5	2.09		120.0
H-6	2.09		120.0
H-7	2.09		120.0

TABLE XXXIV

OBSERVED STRAIN GAGE DATA

Run Number: 1 Date: 17 August 1946

Beam Span 7 feet Load Position 2 feet from near support

Reading Number	Load (pounds) 500	2530	3520	4460
1	1006	1050	1060	1085
2	1217	1001	1009	922
3	899	771	682	598
4	1133	1185	1209	1268
5	842	680	545	218
6	1134	972	881	678
7	1172	1366	1420	1552
8	1201	1109	983	679
9	258	115	942	622
10	390	449	480	550
11	520	337	221	018
12	1104	902	790	600
13	1239	1088	989	853
14	830	750	680	590
15	1067	1011	968	900
16	440	330	271	225
17	102	110	110	118
18	822	809	890	788
19	629	538	489	440
20	450	430	420	418
21	285	260	250	231
22	735	629	570	517
23	150	158	158	163
24	519	492	485	481
25	1032	1009	990	980
26	559	559	563	578
27	285	185	141	097
28	1012	921	878	840
29	909	909	900	808
30	394	289	240	193
31	570	459	398	292
32	890	890	890	880
33	290	315	340	379
34	1040	890	778	530
35	599	432	479	423
36	605	651	697	790
37	529	381	302	138
38	720	547	473	348
39	585	582	616	670
40	169	109	068	062
41	948	851	773	720
42	600	621	627	652
43	532	521	532	542
44	677	647	651	639
45	402	422	452	472

TABLE XXXIV (CONT.)

OBSERVED STRAIN GAGE DATA

Run Number: 1

Date: 17 August 1948

Beam Span 7 feet

Load Position 2 feet from near support

Reading Number	Load (pounds) 500	2550	3520	4460
46	888	815	771	712
47	918	800	751	689
48	599	380	332	305
49	590	479	427	373
50	720	702	707	711
51	800	720	790	798
52	470	450	470	460
53	828	716	670	620
54	139	121	120	120
55	663	693	722	760
61	605	770	873	1020
63	295	244	228	220
64	052	112	175	311
65	894	1088	1230	1490
66	535	613	809	873
67	708	753	792	900
68	1140	1086	1040	871
69	619	867	1102	1705
70	710	796	888	1062
73	269	200	171	170
74	979	911	900	842
75	881	1104	1275	1708
76	1387	1452	1462	1510
77	684	610	570	547
78	1075	1038	1030	1033
79	871	490	580	673
80	626	643	667	697
81	291	200	186	150
82	700	671	662	673
83	382	456	491	540
84	274	297	276	293
87	743	701	698	710
88	1459	1340	1274	1205
89	1450	1491	1533	1543
90	810	797	799	783
91	732	821	834	850
92	761	765	760	757
93	920	883	865	860
94	512	362	387	430
95	253	323	367	445
96	922	939	950	990
97	271	266	272	290
98	553	455	406	360

TABLE XXXV

OBSERVED STRAIN GAGE DATA

Run Number: 2 Date: 19 August 1946

Beam Span 6 feet Load Position 2 feet from near support

Reading Number	Load (pounds) 500	2515	3435	4490	510
1	1230	1219	1260	1200	1190
2	1391	1241	1193	1139	1375
3	1019	853	800	740	1000
4	1553	1372	1471	1428	1333
5	951	713	730	585	920
6	1380	1170	1115	1010	1340
7	582	663	740	772	570
8	1269	1072	1009	902	1240
9	392	199	143	012	350
10	623	659	708	720	612
11	710	520	445	358	705
12	500	300	249	149	480
13	1390	1221	1170	1086	1372
14	881	710	670	590	878
15	1265	1189	1189	1158	1237
16	620	499	464	411	611
17	1230	1219	1242	1323	1222
18	1015	967	989	969	991
19	792	698	670	623	790
20	610	580	600	581	605
21	479	422	430	410	451
22	1146	1003	955	901	1133
23	1370	1328	1359	1340	1340
24	712	668	695	660	699
25	1161	1129	1139	1110	1151
26	714	710	748	740	698
27	1380	1288	1275	1219	1372
28	1160	1068	1042	1003	1161
29	1152	1124	1140	1122	1139
30	613	480	408	308	598
31	630	542	521	457	642
32	975	960	980	965	961
33	1310	1348	1340	1340	1310
34	969	852	790	700	940
35	520	520	525	501	518
36	842	781	813	815	825
37	1550	1402	1353	1273	1449
38	810	610	547	468	792
39	798	730	739	740	768
40	697	613	539	540	677
41	1160	1002	965	910	1125
42	837	812	880	835	812
43	698	650	654	662	688
44	880	868	821	810	829
45	606	629	641	623	579

TABLE XXXV (CONT.)

OBSERVED STRAIN GAGE DATA

Run Number: 2 Date: 1[illegible] August 1[illegible]

Beam Span 6 feet Load Position 2 feet from near support

Reading Number	Load (pounds) 500	2515	5495	4480	510
46	965	890	872	851	951
47	901	859	820	770	978
48	726	700	690	660	680
49	820	730	659	590	798
50	927	882	886	879	909
51	1080	1082	1057	1050	1045
52	706	707	690	669	670
53	967	928	852	802	980
54	1278	1220	1305	1239	1288
55	819	855	870	860	820
61	960	1140	1193	1243	952
63	1335	1329	1276	1251	1300
64	1247	1325	1359	1371	1204
65	1477	1640	1732	1803	1452
66	1550	1642	1655	1678	1539
67	785	819	823	842	772
68	1200	1172	1120	1097	1180
69	705	930	1040	1144	715
70	1017	1168	1177	1216	1024
73	1308	1387	1317	1301	1372
74	1066	1073	1031	1000	1020
75	576	783	852	950	550
76	693	763	797	770	656
77	885	846	773	743	853
78	1273	1270	1221	1212	1250
79	1704	1352	1902	1970	1692
80	1718	1768	1779	1797	1711
81	1443	1406	1365	1306	1424
82	872	888	900	840	844
83	1563	1626	1652	1676	[illegible]
84	1410	1421	1410	1401	1404
87	943	939	936	909	952
88	780	827	632	570	730
89	730	879	842	802	780
90	898	918	903	910	[illegible]
91	930	988	965	920	850
92	830	820	793	800	732
93	1030	1000	983	970	1010
94	1533	1315	1410	1442	1317
95	1370	1460	1480	1513	1382
96	1060	1103	1100	1115	1082
97	458	442	435	441	402
98	700	663	583	553	690

TABLE XXXVI

OBSERVED STRAIN GAGE DATA

Run Number: 3 Date: 19 August 1946

Beam Span 5 feet Load Position 2 feet from near support

Reading Number	Load (pounds) 490	2480	3510	4535	515
1	1155	1150	1159	1152	1168
2	1349	1200	1129	1060	1266
3	1010	845	749	661	585
4	374	354	360	362	253
5	878	891	623	539	727
6	1349	1151	1055	973	1240
7	528	612	649	676	459
8	1228	1045	939	841	1125
9	1526	1132	1066	970	1227
10	572	592	585	590	490
11	660	489	378	230	568
12	488	296	212	118	380
13	1366	1206	1131	1052	1252
14	896	739	680	613	812
15	1221	1138	1036	1064	1119
16	583	461	396	332	498
17	1212	1160	1150	1141	1108
18	971	910	850	870	868
19	788	649	595	540	672
20	588	518	501	480	452
21	1380	1296	1279	1238	1264
22	1130	988	901	836	1035
23	1338	1262	1212	1239	1210
24	1664	1597	1592	1552	1540
25	1132	1066	1040	1009	1029
26	698	649	641	630	579
27	405	270	232	180	295
28	1119	1006	965	909	1026
29	1149	1053	1044	1012	1029
30	1509	1377	1331	1261	1420
31	612	501	440	389	529
32	972	920	922	912	861
33	1333	1280	1298	1291	1231
34	905	766	700	630	811
35	1471	1409	1408	1401	1361
36	870	789	787	785	759
37	566	394	355	260	440
38	778	591	509	427	689
39	778	730	712	698	899
40	650	549	525	480	572
41	1145	980	910	860	103
42	836	779	770	772	730
43	682	631	613	619	599
44	859	752	740	723	720
45	580	539	552	559	472

TABLE XXXVI (CON'T)

OBSERVED STRAIN GAGE DATA

Run Number: 3 Date: 1[illegible] August 1948

Beam Span 5 feet Load position 2 feet from near support

Reading Number	Load (pounds) 490	2480	3510	4535	515
46	930	847	811	775	851
47	1002	850	773	720	852
48	852	602	501	580	608
49	7[illegible]	639	583	532	680
50	910	830	920	802	792
51	1038	963	955	936	922
52	680	605	592	560	560
53	981	831	770	705	862
54	1255	1191	1151	1130	1160
55	830	801	819	820	708
61	922	990	1030	1060	840
63	310	300	270	232	252
64	1212	1205	1222	1246	1000
65	1435	1510	1570	1618	1328
66	612	655	685	712	580
67	812	800	312	838	751
68	1182	1081	1042	1015	1080
69	707	824	912	995	990
70	1018	1030	1058	1032	900
73	1340	1256	1220	1180	1242
74	1072	962	930	892	960
75	532	640	720	752	413
76	648	630	642	648	533
77	[illegible]	720	680	632	738
78	1140	1154	1132	1110	1128
79	720	816	812	853	617
80	772	746	738	730	660
81	1400	1280	1234	1194	1202
82	1765	1722	1704	1700	1682
83	1471	1518	1528	1547	1404
84	1336	1326	1304	1295	1270
87	890	800	754	730	770
88	755	574	517	472	320
89	737	749	745	746	600
90	903	855	835	826	810
91	870	892	900	910	832
92	767	757	740	732	723
93	1000	934	900	881	902
94	1318	1330	1338	1363	1233
95	392	410	417	427	322
96	1020	1017	1000	1000	965
97	357	367	357	360	237
98	650	580	520	480	500

TABLE XXXVII

[illegible] STRAIN GAGE DATA

Date: 23 August 1946

Run Number: 4

Beam Span 7 feet   Load Position 1[illegible] feet from near support

Reading Number	Load (pounds) 500	2070	3495	4520	525
1	473	439	420	500	458
2	651	586	440	402	154
3	1237	1116	1056	963	1210
4	801	815	952	953	740
5	1205	1057	997	922	1220
6	752	578	490	450	755
7	786	809	326	841	755
8	541	557	230	200	[illegible]
9	780	605	538	435	745
10	348	885	822	857	851
11	941	752	715	611	754
12	950	822	720	861	[illegible]
13	1613	[illegible]	1554	1328	1559
14	852	684	950	561	810
15	1428	1515	1370	1340	1140
16	852	744	690	627	560
17	548	528	530	530	522
18	1231	1178	1155	1165	1210
19	1047	951	379	629	1027
20	908	860	861	852	855
21	1654	1612	1560	1540	1600
22	1508	1322	1100	1156	1371
23	1582	1525	1521	1545	1551
24	951	890	330	870	921
25	1806	1310	1295	1255	1345
26	990	975	971	998	952
27	631	535	457	400	600
28	1541	1241	1130	1147	1326
29	1419	1400	1357	1340	1382
30	674	728	669	610	829
31	892	780	740	638	854
32	1229	1102	1177	1188	1190
33	650	610	611	650	585
34	1161	1056	1010	970	1142
35	750	745	734	734	747
36	1148	1180	1179	1197	1149
37	818	671	550	482	681
38	1147	1111	1075	1065	1085
39	1176	1141	1150	1205	1200
40	1101	966	865	815	990
41	1415	1248	1116	1078	1300
42	1215	1153	1135	1169	1212
43	1040	1001	[illegible]	[illegible]	1021
44	1081	[illegible]	1042	[illegible]	[illegible]
45	[illegible]	796	[illegible]	781	[illegible]

TABLE XXXVII (CON'T.)

[illegible] STRAIN GAGE DATA

Run Number: 4 Date: 23 August 19[illegible]

Beam Span 7 feet Load Position 1_ feet from near support

Reading Number	Load (pounds) 500	2530	3475	4480	5[illegible]
46	1281	1270	1260	1280	1245
47	1298	1281	1260	1201	1200
48	1028	1015	1022	1015	952
49	1110	1045	980	919	1040
50	1240	1105	1045	980	1162
51	1345	1280	1279	1274	1298
52	1043	935	903	899	1015
53	1250	1098	1040	978	1210
54	1593	1530	1516	1541	1557
55	1129	1113	1119	1130	1085
61	1236	1363	1413	1494	1250
63	637	563	551	541	580
64	543	551	503	634	500
65	907	990	1073	1140	877
66	862	842	873	900	720
67	1078	1060	1020	1106	1036
68	1430	1364	1397	1373	1410
69	1200	1348	1440	1523	1218
70	1233	1309	1362	1403	1240
73	1617	1653	1683	1714	1630
74	1373	1273	1280	1240	1328
75	865	1010	1133	1235	878
76	937	948	1000	1044	910
77	1142	1030	1000	950	1089
78	588	515	512	610	573
79	1087	1207	1307	1459	1120
80	1053	1013	1043	1071	992
81	1695	1565	1540	1514	1662
82	1130	1072	1087	1000	1102
83	1769	1820	1884	1925	1752
84	1657	1507	1517	1622	1617
87	1253	1132	1143	1133	1223
88	1104	949	905	840	1072
89	1075	1097	1133	1170	1078
90	1130	1153	1148	1138	1146
91	1192	1130	1195	1192	1156
92	123	87	80	83	83
93	1247	1197	1190	1180	1211
94	505	614	633	660	568
95	650	709	739	768	652
96	1660	1540	1556	1373	1702
97	[illegible]	633	653	662	[illegible]
98	920	862	820	782	915

TABLE XXXVIII

[illegible] STRAIN GAGE DATA

Run Number: 5 Date: 26 August 1[illegible]

Beam Span 8 feet Load Position 1[illegible] feet from near support

Reading Number	Load (pounds) 500	2500	3500	4405	5500
1	381	473	437	513	450
2	610	520	466	403	635
3	1178	780	738	652	873
4	713	1312	1455	1302	1120
5	1221	1109	1046	968	1252
6	775	672	610	542	795
7	751	730	813	853	759
8	1447	1360	1260	1202	1455
9	730	660	502	548	782
10	788	808	652	870	808
11	940	852	803	778	956
12	934	902	855	505	1010
13	632	570	531	420	650
14	963	902	860	851	983
15	1430	1398	1372	1350	1440
16	817	698	650	581	802
17	460	459	464	492	460
18	1187	1180	1172	1163	1193
19	983	907	865	815	992
20	840	853	852	846	872
21	640	639	628	609	659
22	1424	1047	975	868	1130
23	1530	1550	1553	1536	1538
24	903	905	892	881	920
25	1328	1335	1321	1293	1350
26	940	983	991	1002	961
27	575	489	448	420	573
28	1317	1243	1200	1161	1323
29	1331	1417	1397	1392	1412
30	818	706	655	605	802
31	941	810	778	750	861
32	1133	1170	1163	1172	1148
33	488	525	530	541	520
34	1141	1112	1063	1058	1172
35	683	725	7[illegible]	703	717
36	1105	1122	1132	1133	1110
37	1452	992	952	886	1072
38	1046	1017	1015	1017	1017
39	1110	1298	1298	1301	1311
40	1041	1260	1219	1108	1340
41	1565	1302	1720	1330	1541
42	1150	1199	1112	1120	1220
43	973	990	980	987	992
44	1041	1072	1071	[illegible]	1073
45	771	807	700	[illegible]	818

TABLE XXXVIII (CON'T)

[illegible]

Run Number: 5 Date: 20 August 1956

Beam Span 5 feet Load Position 1 feet from near support

Reading Number	Load (pounds) 500	2000	3500	44[illegible]	500
46	1210	1472	1689	1500	1242
47	1230	1268	1232	1261	1276
48	945	900	915	930	870
49	1027	640	613	578	608
50	1119	821	775	727	923
51	1303	1325	1518	1509	1358
52	978	1052	1030	1034	1047
53	1182	998	949	895	1100
54	570	629	631	642	640
55	1085	1115	1130	1143	1081
61	323	400	439	478	3[illegible]1
63	534	567	560	550	58[illegible]
64	501	5[illegible]	573	536	50[illegible]
65	900	1004	1057	1107	910
66	550	591	5[illegible]	645	590
67	850	930	887	528	870
68	1395	1379	1372	1368	1402
69	1251	1418	1483	15[illegible]	1501
70	1265	1718	1758	1800	1652
73	873	1000	1024	1040	[illegible]
74	1317	1163	1163	1140	12[illegible]
75	872	11[illegible]9	1250	1537	1020
76	914	1527	1560	1394	1270
77	1028	960	935	905	1000
78	577	576	[illegible]	[illegible]	614
79	1140	1103	1272	1350	10[illegible]
80	1000	1017	1065	1030	1019
81	71[illegible]	640	610	[illegible]00	714
82	1085	1142	1143	1143	11[illegible]
83	80[illegible]	[illegible]	930	936	920
84	680	705	707	708	708
87	1207	1208	1209	1237	1242
88	1000	873	850	795	987
89	1027	1210	1232	1252	1176
90	1117	1114	1117	1117	1120
91	1120	1152	1172	1180	1120
92	950	948	947	950	958
93	1194	1170	1167	1160	1189
94	1424	1462	1483	1520	1455
95	641	677	636	715	645
96	1523	1535	1543	1552	1730
97	643	662	673	684	643
98	924	688	[illegible]07	643	[illegible]20

TABLE XXXIX

OBSERVED STRAIN GAGE DATA

Run Number: 6 Date: 26 August 1940

Beam span 4 feet Load Position [illegible] feet from near support

Reading Number	Load (pounds)				
	[illegible]	2000	3000	4000	[illegible]
1	1537	1440	[illegible]	[illegible]	[illegible]
2	625	540	[illegible]	440	641
3	938	802	74[illegible]	7[illegible]	[illegible]
4	1119	1200	[illegible]	[illegible]	1120
5	1242	1104	1062	1022	1242
6	80[illegible]	6[illegible]	6[illegible]	[illegible]	805
7	750	735	730	810	751
8	1486	1361	1315	1260	1485
9	910	719	670	605	803
10	906	828	850	848	801
11	960	872	855	[illegible]	957
12	1025	948	912	876	1021
13	666	620	600	57[illegible]	662
14	1017	978	958	920	1016
15	1450	1404	1387	1362	1448
16	800	719	673	633	810
17	464	473	421	4[illegible]	47[illegible]
18	1196	1182	1190	1172	1191
19	926	918	875	842	[illegible]
20	960	858	854	861	872
21	662	640	600	[illegible]	[illegible]
22	1220	1095	1028	[illegible]	1216
23	590	590	590	580	580
24	924	[illegible]08	800	[illegible]	920
25	1355	1337	1317	1300	135[illegible]
26	961	979	982	[illegible]	[illegible]
27	1541	1462	1432	1392	1540
28	1050	1224	1221	1187	1527
29	1418	1418	1556	1511	1415
30	752	700	300	61[illegible]	750
31	872	632	810	76[illegible]	871
32	1151	1189	11[illegible]	1[illegible]	1151
33	1481	1502	1400	[illegible]	1481
34	1180	11[illegible]	1095	10[illegible]	117[illegible]
35	720	742	75[illegible]	761	721
36	1122	1142	1152	11[illegible]	11[illegible]2
37	1081	1000	[illegible]60	913	1081
38	1027	1055	1065	107[illegible]	1056
39	1340	1355	1355	1356	1365
40	1[illegible]52	1272	1253	11[illegible]	1352
41	618	4[illegible]1	450	372	651
42	1251	1260	1262	126[illegible]	1272
43	1005	1005	1005	100[illegible]	1010
44	1080	1079	1072	1063	107[illegible]
45	815	802	800	790	810

TABLE XXXIX (CON'T)

O[illegible] STRAIN GAGE DATA

Run Number: 6 Date: 2[illegible] August 1[illegible]

Beam Span 1[illegible] feet Load Position 1[illegible] feet from near support

Reading number	Load (pounds) 500	2500	3500	4500	4[illegible]0
46	1[illegible]	1[illegible]2	1312	1335	1[illegible]2
47	1[illegible]	1[illegible]3	1336	1298	1301
48	878	[illegible]12	929	942	801
49	70[illegible]	658	651	612	712
50	941	85[illegible]	[illegible]12	770	960
51	1310	1327	161[illegible]	1310	1340
52	1049	1050	1052	1058	1061
53	1098	1003	971	919	1103
54	623	620	620	625	631
55	1030	1129	1140	1171	1081
61	1250	1287	1300	1316	1243
63	595	582	578	577	599
64	500	533	547	559	409
65	895	967	993	1024	850
66	1552	1575	1590	1610	1547
67	875	913	934	963	878
68	1419	1307	1395	1390	1415
69	1[illegible]	1383	1433	1480	1283
70	700	763	792	822	698
73	9[illegible]	1003	1026	1053	953
74	233	228	210	197	270
75	1005	1142	1207	1273	990
76	1268	1323	1348	1373	1[illegible]
77	1006	949	921	897	1005
78	612	578	568	552	616
79	1052	1180	1239	1300	104[illegible]
80	1017	1044	1055	1090	1013
81	697	626	507	506	[illegible]
82	11[illegible]7	1126	1170	1123	1140
83	819	878	909	937	810
84	705	704	703	703	705
87	11[illegible]7	1170	1177	1193	1203
88	950	850	812	762	961
89	1170	1204	1220	1232	1163
90	1131	1120	1151	11[illegible]	1132
91	1122	1166	1187	1210	1119
92	963	962	960	960	963
93	1202	1190	1189	1192	1202
94	1420	1474	1497	1522	1420
95	1580	1606	1612	1619	1581
96	1333	1340	1343	1343	1332
97	15[illegible]3	1628	1645	1663	1588
98	937	912	901	887	955

TABLE XL

[illegible] STRAIN GAGE DATA

Run Number 7 Date: 20 August 19[illegible]

Beam Span 7 feet Load Position 2½ feet from near support

Reading Number	Load (pounds) 470	[illegible]	3555	4480	5[illegible]
1	1510	1352	1370	1389	1307
2	1010	1330	1315	1255	1483
3	820	699	632	[illegible]	739
4	1030	1071	1008	1121	1011
5	117[illegible]	971	872	790	1132
6	617	634	542	441	720
7	16[illegible]	1635	1701	1749	1[illegible]
8	1331	1185	1072	965	1130
9	932	800	639	410	761
10	772	953	909	1177	940
11	600	700	581		420
12	1303	1108	997	433	866
13	14[illegible]	1278	1157	610	1221
14	1670	1458	1355	[illegible]	1500
15	1320	1339	1316	1207	1377
16	770	635	600	546	731
17	1306	1513	1021	1309	[illegible]
18	1110	1103	1078	1051	1115
19	920	839	799	742	921
20	770	760	759	764	772
21	1606	1502	1490	1150	1521
22	1410	1302	1240	1182	1410
23	1402	1461	1[illegible]	1462	1470
24	847	878	818	810	941
25	1260	1340	1250	1221	1255
26	878	807	905	911	872
27	1438	1353	1515	1282	1420
28	1257	1150	1121	1106	[illegible]
29	1360	1349	1644	1338	1563
30	719	629	582	542	720
31	752	509	486	[illegible]	530
32	970	971	941	868	980
33	1357	128[illegible]	1332	1170	1161
34	117[illegible]	951	820	771	840
35	147[illegible]	1331	1291	1101	15[illegible]
36	900	968	1015	1103	1076
37	1032	935	882	859	1050
38	910	909	756	718	910
39	1290	1282	1267	1178	1218
40	1540	1470	1432	1401	1508
41	1520	1410	1360	1310	1521
42	1167	1183	1142	1201	1160
43	875	730	717	650	832
44	909	1040	1020	1011	931
45	71[illegible]	740	720	719	719

TABLE XL (CONT.)

OBSERVED STRAIN GAGE DATA

Run Number 7 Date: 30 August 1946

Beam Span 7 feet Load Position 3½ feet from near support

Reading Number	Load (pounds) 470	2400	3555	4480	505
46	1110	1019	972	942	1130
47	1151	1140	1160	1160	1170
48	867	861	859	865	864
49	671	597	541	500	678
50	871	863	862	860	871
51	1519	1512	1509	1502	1518
52	974	970	971	975	972
53	1020	931	869	849	1021
54	1466	[illegible]	1468	1471	1466
55	851	[illegible]	852	792	886
61	1540	1462	1560	1148	1550
63	1415	1368	1355	1196	1304
64	429	540	692	1025	710
65	955	1207	1358	1513	803
66	1073	1157	1181	1255	1114
67	469	442	410	355	423
68	1267	1210	1104	1108	1025
69	873	513	1040	1367	810
70	917	698	758	753	816
73	830	780	755	715	835
74	1116	1093	1077	1052	1122
75	940	1115	1202	1263	950
76	1220	1275	1300	1303	1223
77	930	873	844	803	937
78	515	492	465	462	510
79	1035	1154	1213	1248	1040
80	946	975	990	982	949
81	1565	1501	1466	1422	1570
82	1019	1003	1002	967	1017
83	740	803	840	847	743
84	633	633	633	610	634
87	1072	1050	1050	1057	1073
88	967	866	822	765	972
89	1148	1163	1197	1150	1155
90	1000	1103	1014	1000	1022
91	[illegible]	1031	1050	1077	1021
92	780	767	744	743	784
93	1030	1020	1002	937	1020
94	1222	1302	1355	1410	1280
95	570	607	715	632	708
96	1240	1274	1293	1333	1290
97	547	553	553	512	530
98	836	726	683	483	723

TABLE XLI

[illegible] DATA

Run Number: 6 　　　　　　　　　　　　Date: [illegible] August [illegible]16

Beam Span [illegible] feet 　　Load Position 2[illegible] feet from near support

Reading Number	Load (Pounds) 420	[illegible]	3475	[illegible]	[illegible]	510
1	1315	[illegible]	1330	[illegible]	[illegible]	1315
2	1502	1308	1350	1279	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	1321	[illegible]	[illegible]	1111	[illegible]	[illegible]
5	1170	[illegible]71	[illegible]	[illegible]	[illegible]	1110
6	[illegible]	661	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	855	760	720	[illegible]	[illegible]
8	1260	[illegible]	[illegible]71	[illegible]	[illegible]	[illegible]17
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	1148	[illegible]	[illegible]
11	1411	1205	[illegible]	1005	[illegible]	[illegible]
12	837	700	[illegible]	[illegible]	[illegible]	[illegible]
13	1252	1016	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	1021	[illegible]	832
15	1370	[illegible]	[illegible]	[illegible]	[illegible]	1377
16	738	[illegible]	[illegible]	501	[illegible]	732
17	[illegible]	1310	1218	[illegible]	[illegible]	1306
18	1116	1103	[illegible]	1001	1061	1112
19	[illegible]	819	[illegible]	773	725	[illegible]
20	782	[illegible]	755	[illegible]	[illegible]	[illegible]
21	[illegible]	1509	[illegible]	[illegible]	1470	[illegible]
22	[illegible]	[illegible]	[illegible]	1215	[illegible]	[illegible]
23	[illegible]	[illegible]	1480	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	818	[illegible]	[illegible]	[illegible]
25	[illegible]	1240	1051	[illegible]	[illegible]	[illegible]
26	[illegible]	890	808	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	[illegible]	[illegible]	1240	[illegible]
28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31	[illegible]	[illegible]	1066	[illegible]	[illegible]	[illegible]
32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33	1440	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34	[illegible]	727	[illegible]	[illegible]	[illegible]	[illegible]
35	1307	[illegible]	[illegible]	1122	[illegible]	[illegible]
36	1078	1090	[illegible]	[illegible]	1081	[illegible]
37	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1128
38	[illegible]	810	770	720	[illegible]	[illegible]
39	[illegible]	[illegible]	[illegible]	[illegible]	1289	[illegible]
40	[illegible]	1477	[illegible]	[illegible]	[illegible]	[illegible]
41	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
42	1168	1181	1169	1166	[illegible]	[illegible]
43	[illegible]	742	700	653	[illegible]	704
44	880	[illegible]	1029	[illegible]	1030	950
45	742	730	720	711	710	732

TABLE XLI (CONT)

[illegible] DATA

Run Number: 8 Date: [illegible] August 1948

Beam Span [illegible] feet Load Position [illegible] feet from near support

Reading Number	Load (pounds) [illegible]	[illegible]	3475	[illegible]	[illegible]	510
46	[illegible]	1045	1002	[illegible]	881	1120
47	1170	[illegible]	1102	1130	1180	1100
48	[illegible]	860	846	851	843	866
49	600	507	567	516	455	670
50	672	865	861	860	859	870
51	1315	1310	1305	1300	1301	1318
52	972	968	960	989	972	971
53	1022	[illegible]	901	860	803	1022
54	1468	1415	1456	1450	1472	1460
55	827	811	832	812	720	829
61	1510	1806	1785	1877	1528	1970
63	1307	1255	1230	1206	917	1090
64	778	881	935	937	1738	1437
65	785	1010	1173	1147	844	294
66	1073	1145	1181	1220	1717	1508
67	400	570	355	547	303	378
68	1104	1172	1150	1125	382	1110
69	[illegible]	1112	1220	1337	1103	486
70	1500	1632	1360	1702	1747	1555
73	634	780	780	735	707	830
74	1123	1092	1082	1080	1257	1119
75	905	1022	1169	1246	1354	943
76	1217	1267	1300	1310	1339	1220
77	937	877	850	824	720	936
78	1476	1452	1448	1438	1457	1431
79	1070	1110	1150	1240	1307	1035
80	915	970	982	992	1001	943
81	1563	1500	1475	1445	1410	1568
82	1018	926	[illegible]	995	1005	1013
83	1555	1745	1774	1800	1535	1887
84	1578	1579	1578	1575	1561	1578
87	1071	1062	1032	1032	1052	1068
88	977	865	825	783	732	970
89	1145	1179	1190	1202	1210	1150
90	1020	1017	1016	1014	1027	1027
91	1013	1065	1067	1110	1155	1080
92	775	735	757	749	720	754
93	1020	909	974	960	900	975
94	385	410	445	485	680	484
95	[illegible]	781	820	860	1113	805
96	1285	1313	1327	1342	1443	1380
97	530	547	551	558	562	530
98	728	632	582	529	518	490

APPENDIX E

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11667

Thesis Wright
W9
An investigation of the shear stress distribution in a simply supported I-beam with a concentrated load acting near one end.